UNITED STATES
ATOMIC ENERGY
COMMISSION

16mm FILM CATALOG

PROFESSIONAL LEVEL

1966 - 67

REPRINTED WITH ADDITIONS

NOTICE

This printing of the USAEC Professional-Level Film Catalog 1966–1967 contains information on 11 additional films released since the publication of the 1965 edition. Descriptions of these new films, which are listed below with their categories, are found beginning on page 88.

Subject Category	Title
Aero-Space Programs: SNAP	First Reactor in Space: SNAP-10A
	SNAP-8: System for Nuclear Auxiliary Power
Aero-Space Programs: VELA	Operation Long Shot
Biology and Medicine	Extracorporeal Irradiation of Blood and Lymph
	Return to Bikini
Fuels, Processing and Metallurgy	Shear-Leach Process for Spent Nuclear Fuels
Peaceful Uses of Nuclear Explosives (Plowshare)	Safety in the Plowshare Program
Power Reactors	Atomic Power Today: Service with Safety
Safety, Waste Disposal, and Monitoring	Atoms on the Move: The Transportation of Radioactive Materials
	Controlling Records Fires with High Expansion Foam
	Waste Disposal by Hydraulic Fracturing

FOREWORD

USAEC motion pictures listed in this catalog are available for *free* loan, without charge for public non-profit exhibition. Most films, with the few exceptions noted in those film descriptions, are available from USAEC headquarters and field libraries.

CONTENTS

ALPHABETICAL INDEX OF PROFESSIONAL FILM TITLES

A WORD TO NEW BORROWERS

As part of its information and education program, the U. S. Atomic Energy Commission maintains motion-picture libraries from which qualified borrowers throughout the United States and Canada may obtain 16-mm sound-track films that explain various aspects of atomic energy. This catalog deals with professional-level technical films available from 10 domestic USAEC film libraries. There is a separate catalog for popular-level films. Copies of both catalogs may be obtained from the Audio-Visual Branch, Division of Public Information, U. S. Atomic Energy Commission, Washington, D. C. 20545; the Exhibits and Educational Services Branch, Division of Technical Information, U. S. Atomic Energy Commission, Washington, D. C. 20545; or the Division of Technical Information Extension, U. S. Atomic Energy Commission, P. O. Box 62, Oak Ridge, Tenn. 37830. Catalog supplements are issued periodically.

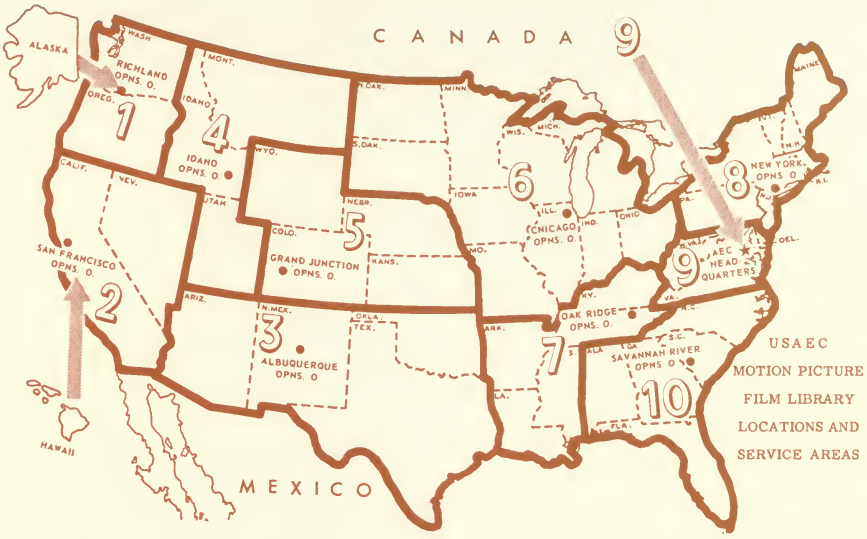
All these films are loaned free, and only for educational, nonprofit, and noncommercial screenings.

Television stations may order films marked "Cleared for television" for unsponsored public service or sustaining telecasts.

There are 13 subject categories, which are listed in the Table of Contents. The films and cross references are listed alphabetically within each category. In ordering please refer to full film title.

PLEASE NOTE: Title listings and borrowing instructions contained in this catalog pertain directly to the USAEC's headquarters film library, which serves Canada, Delaware, District of Columbia, Maryland, Virginia, and West Virginia. Other USAEC film libraries may issue slightly different title listings and instructions tailored to their particular needs. Borrowers should therefore be guided by the specific information supplied by the library which is servicing their requests.

FOREIGN BORROWERS: Please refer to "Advice To Foreign Borrowers," page xvi.



USAEC MOTION PICTURE FILM LIBRARY LOCATIONS AND SERVICE AREAS

AEC DOMESTIC FILM LIBRARIES

Prints of the films are available to the areas listed for free-loan from the following 10 domestic film libraries of the Atomic Energy Commission:

Area Served	Film Library
Alaska, Oregon, Washington	Film Library Information Division U. S. Atomic Energy Commission Richland Operations Office P. O. Box 550 Richland, Washington 99352 Phone: 509-942-1111, Ext. 64846
California, Hawaii, Nevada	Public Information Office U. S. Atomic Energy Commission San Francisco Operations Office 2111 Bancroft Way Berkeley, California 94704 Phone: 415-841-4212
Arizona, New Mexico, Oklahoma, Texas	Film Librarian Information Division U. S. Atomic Energy Commission P. O. Box 5400 Albuquerque, New Mexico 87115 Phone: 505-264-7238

Idaho, Montana, Utah	Mack C. Corbett, Director Office of Information U. S. Atomic Energy Commission Idaho Operations Office P. O. Box 2108 Idaho Falls, Idaho 83401 Phone: 208-526-1317
Colorado, Kansas, Nebraska, Wyoming	Neilsen B. O'Rear, Director Information Division U. S. Atomic Energy Commission Grand Junction Office Grand Junction, Colorado 81502 Phone: 303-242-8229
Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, North Dakota, Ohio, South Dakota, Wisconsin	Ruth Jones Information Office U. S. Atomic Energy Commission Chicago Operations Office 9800 South Cass Avenue Argonne, Illinois 60439 Phone: 312-739-7711, Ext. 2109
Arkansas, Kentucky, Tennessee, Louisiana, Mississippi	Peggy McConnell, Film Librarian Public Information Office U. S. Atomic Energy Commission Oak Ridge Operations Office P. O. Box E Oak Ridge, Tennessee 37830 Phone: 615-483-4231
Pennsylvania, New York, Vermont, New Hampshire, Maine, Massachusetts, New Jersey, Rhode Island, Connecticut	Beatrice Martinelli Public Information Service U. S. Atomic Energy Commission New York Operations Office 376 Hudson Street New York, New York 10014 Phone: 212-489-1234
Delaware, Maryland, Virginia, District of Columbia, West Virginia, Canada	Sid L. Schwartz Audio-Visual Branch Division of Public Information U. S. Atomic Energy Commission Washington, D. C. 20545 Phone: 301-973-4239
North Carolina, South Carolina, Alabama, Georgia, Florida	Film Librarian U. S. Atomic Energy Commission Savannah River Operations Office P. O. Box A Aiken, South Carolina 29801 Phone: 803-824-6331, Ext. 3267

CANADIAN BORROWERS

Residents of Canada may obtain many of the films in this catalog from the National Science Film Library, Canadian Film Institute, 1762 Carling St., Ottawa 13, Canada. Films not available from this source may be ordered by writing directly to the Audio-Visual Branch, Division of Public Information, U. S. Atomic Energy Commission, Washington, D. C. 20545.

WHO MAY BORROW

Residents of the United States and Canada who are bona fide representatives of educational, civic, industrial, professional, youth activity, and government organizations are invited to borrow films from the USAEC Motion Picture Library which services their area. Because of wear and tear that results from repeated projection, films are loaned for *group* showings, and *not* for screening before individuals or in homes. Because custody of the films involves both legal and financial responsibility, films cannot be loaned to minors.

Television stations may order films marked "Cleared for television" for unsponsored public service or sustaining telecasts. However, films produced by the United States Information Agency (USIA) for its "Atoms for Peace" series may be employed only for local, non-network programs, and must be telecast in their entirety.

HOW TO ORDER

USAEC Motion Picture Libraries enjoy heavy patronage throughout the year, so it is important that borrowers needing particular titles should make their requests as far in advance of their scheduled showing date as possible. Most USAEC libraries request at least three weeks advance notice on all films ordered. Since some titles are booked solidly in advance for several months, borrowers should attempt to specify at least two other acceptable titles and one other acceptable alternate showing date. (Most USAEC libraries respond to all requests involving a conflict with advice on what film will be shipped, and when.)

LOAN REQUIREMENTS

The following requirements apply to all films and all borrowers, regardless of which USAEC Motion Picture Library provides the service:

1. Projection must be on *good* motion picture sound equipment, and by a *trained* operator.
2. No borrower may remove under any circumstances — even temporarily — any footage from USAEC library films on loan to him, either to delete damaged sprocket holes or to edit or digest selected scenes.
3. Films do break, and occasionally will require splicing by the borrower. However, we prefer that damaged films be returned to the libraries for the professional repairs available there. Do not use

"scotch" tape for emergency splices. Either unrepaired damage or splicing accomplished by the borrower should be noted on the "Report of Screenings and Attendance" so that the film may be fully repaired before it is shipped to the next borrower.

4. Borrowers planning to show a number of films on a protracted schedule should request delivery of specific films on a staggered schedule to facilitate maximum use by other borrowers. No borrower may hold a film past scheduled return date without express prior permission of the issuing USAEC library.

5. No borrower may release a USAEC film from his personal possession for reloan to another individual or agency without express prior permission of the issuing USAEC library. Except where heavy demand requires tighter scheduling, borrowers are normally allowed to retain films for four or five days.

6. Borrowers are obligated to complete the "Report of Screenings and Attendance" report enclosed with each film.

7. A few of the libraries, namely New York, Chicago, and San Francisco Operations Offices, prefer that a film be returned to the can after the last screening *without rewinding.* However, most of the remaining USAEC libraries prefer to have film rewound unless they issue specific contrary instructions.

8. Films are shipped from the libraries at government expense, but return shipment charges are borne by the borrower.

9. Films are normally shipped by parcel post, but it is the borrower's responsibility to use any available means — including air express, air mail, or personal delivery — to assure that films being returned will reach the libraries on or before the due date.

10. Borrowers must reimburse the government for any damage beyond normal wear and tear to USAEC library films, and for any lost films. All libraries require that borrowers insure each reel for $50.00 during its return shipment to provide proof of mailing, to facilitate tracing of temporarily lost films, and to permit ready replacement of any films lost permanently.

Optimum service to the thousands of borrowers utilizing USAEC Motion Picture Libraries is possible only when each individual borrower complies fully with these requirements. Failure of a borrower to follow the instructions of the library that has serviced his request may result in suspension of the service to the borrower and his organization.

ADVICE TO FOREIGN BORROWERS

Because most of the titles stocked by the USAEC motion picture film libraries are in heavy demand by U. S. borrowers and because shipments abroad would involve lengthy, nonproductive periods in transit, it is not considered practical to extend this film library service to other than U. S. and Canadian residents.

However, a number of titles listed in this catalog have been acquired by the U. S. Information Agency for use in various U. S. Information Service film libraries throughout the world. Residents of each nation should seek assistance directly from the nearest U. S. Information Service at the American Embassy in the capital city of their country.

In addition, prints owned by the USAEC are available for loan to the U. S. Information Agency in Washington, which will arrange to provide prints on a brief loan basis to the U. S. Information Service posts overseas.

Also, the USAEC maintains four film libraries overseas, at its liaison offices at the American embassies in Tokyo, Brussels, London, and Buenos Aires. The films are maintained in behalf of the Commission by the U. S. Information Service posts at those embassies. Please direct your inquiry to the USAEC office at the embassy.

Many of the films in this catalog are in the film library of the International Atomic Energy Agency, Vienna, and in the American Film Library, The Hague, Holland.

WHERE TO PURCHASE PRINTS

Most films listed in this catalog may be purchased from private commercial suppliers — NOT the USAEC. It is suggested that organizations which have continuing requirements for repeated screenings of the same film may find it more satisfactory, and perhaps more economical also, to own a print than to borrow it.

In the following Description of Films, wherever possible the commercial supplier from whom prints may be purchased, and also the approximate price as known is indicated. Since prices may change, we suggest that prospective purchasers obtain up-to-date quotations before ordering, by writing to the proper commercial supplier:

ABBOTT LABORATORIES
Dept. of Radio-Pharmaceuticals
14th & Sheridan Road
North Chicago, Illinois 60064

AUDIO PRODUCTIONS, INC.
630 Ninth Avenue
New York, N. Y. 10036

BYRON MOTION PICTURES
1226 Wisconsin Avenue, N. W.
Washington, D. C. 20007

CALVIN PRODUCTIONS, INC.
1105 Truman Road
Kansas City, Missouri 64106

CAPITAL FILM LABORATORIES, INC.
470 E. Street, S. W.
Washington, D. C. 20024

COLBURN, GEO. W., LABORATORY, INC.
164 North Wacker Drive
Chicago, Illinois 60606

COLOR SERVICE CO., INC.
115 West 45th Street
New York, N. Y. 10036

CONSOLIDATED FILM INDUSTRIES
959 Seward Street
Hollywood, California 90038

DuART FILM LABORATORIES, INC.
245 West 55th Street
New York, N. Y. 10019

FILMSERVICE LABORATORIES, INC.
6327 Santa Monica Boulevard
Hollywood, California 90038

GENERAL ELECTRIC COMPANY
Film Production and Distribution
60 Washington Avenue
Schenectady, New York 12306

GENERAL FILM LABORATORIES
1546 North Argyle Avenue
Hollywood, California 90028

GERALD PRODUCTIONS, INC.
421 West 54th Street
New York, N. Y. 10019

HOLLYWOOD FILM ENTERPRISES, INC.
6060 Sunset Boulevard
Hollywood, California 90028

IOWA STATE UNIVERSITY
Film Production Unit
Alice Norton House
Ames, Iowa 50010

LANE, ANTHONY STUDIOS, INC.
7401 Wayzata Boulevard
Minneapolis, Minnesota 55416

LOOKOUT MOUNTAIN AIR FORCE STATION, USAF
8935 Wonderland Avenue
Hollywood, California 90046

McNAMARA PRODUCTIONS
Gateway West
Century City, Los Angeles, California

MEDICAL FILM GUILD, LTD.
506 West 57th Street
New York, N. Y. 10019

ORLEANS FILM PRODUCTIONS
Ford Place
Knoxville, Tennessee 37900

PALMER, W. A., FILMS, INC.
611 Howard Street
San Francisco, California 94105

TELEFILM INDUSTRIES, INC.
6039 Hollywood Boulevard
Hollywood, California 90028

U. S. ARMY PICTORIAL CENTER
35-11 35th Avenue
Long Island City, N. Y. 111000

U. S. DEPARTMENT OF AGRICULTURE
Motion Picture Service
Washington, D. C. 20250

U. S. DEPARTMENT OF THE NAVY
Naval Photographic Center
Motion Picture Department
Anacostia, D. C. 20390

UNITED WORLD FILMS
221 Park Avenue South
New York, N. Y. 10003

USAEC STOCK FILM FOOTAGE PROGRAM

The U. S. Atomic Energy Commission, to encourage education and information in the field of atomic energy, has made available for motion picture and television producers 16mm color and 35mm or 16mm black-and-white stock film footage covering nearly all aspects of this broad program.

Color stock footage in 16mm is available from the completed color films made by the USAEC and its national laboratories and contractors. Producers are invited to make *footage counts* on films borrowed from the film libraries and then to contact the Audio-Visual Branch, as noted below, for information on how to obtain duplicating material. Producers are *not* permitted to clip films borrowed from the film libraries.

More than 120,000 feet of unedited 35mm and 16mm black-and-white stock film footage without sound track is also available. The material covers unclassified aspects of nationwide USAEC and contractor research and operations at 13 installations, including the national laboratories.

It should be noted that these materials are NOT COMPLETED MOTION PICTURES FOR GENERAL SHOWING AND ARE NOT FOR LOAN.

The footage is being distributed at standard government cost rates through a government depository. Subject matter lists and information sheets are available.

The footage, although unedited, has been assembled in progression to aid producers in making complete motion pictures, adding their own film editing, narration, titles, etc. Detailed script notes are available to qualified users of the footage in the educational motion picture field, television, industrial and educational organizations, government agencies, etc.

Requests to search and draw from the black-and-white footage, and any other inquiries, should be addressed to the Audio-Visual Branch, Division of Public Information, U. S. Atomic Energy Commission, Washington, D. C. 20545.

DESCRIPTION OF PROFESSIONAL FILMS (by Subject Category)

AERO-SPACE PROGRAMS:

ROVER

PROJECT ROVER (1963). 21½ minutes, color.

Produced by USAEC's Los Alamos Scientific Laboratory. For sale by the Calvin Productions, at $58.33 per print, including shipping case, F.O.B. Kansas City. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

1962 progress report on the USAEC's Project Rover, a program for the development of a nuclear rocket for spacecraft propulsion. An animated explanation of the principle of the nuclear rocket is given demonstrating the advantages of the nuclear rocket system. A survey of the work at the Los Alamos Scientific Laboratory follows, showing work done in the design, fabrication, and testing of a Kiwi non-flying test reactor. This includes: core configuration studies in a "Honeycomb," the reactor design staff at work, the test facilities, the blending of graphite and uranium for fuel, and construction of the reactor components by contractors. Testing of the Kiwi at the Nuclear Rocket Development Station in Nevada is shown.

SNAP (Systems for Nuclear Auxiliary Power)

ATOMIC WEATHERMAN: STRONTIUM-90 ISOTOPIC APPLICATIONS . . . . . See page 42

FABRICATION OF SNAP-7D FUEL SOURCES (1964). 12 minutes, color.

Produced by USAEC's Oak Ridge National Laboratory. For sale by Calvin Productions, at $33.28 per print, including shipping case, F.O.B. Kansas City, Mo. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

Semitechnical film which describes the fabrication of strontium-90 fuel capsules for the SNAP-7D generator which powers an unmanned

Navy Weather Station in the Gulf of Mexico. Purified strontium-90 carbonate was processed at ORNL's Fission Products Development Laboratory to strontium-90 titanate, pressed into pellets and then encapsulated. Most of the film is devoted to the pelletizing and encapsulating operations within the hot cells of the FPDL.

NUCLEAR POWER FOR SPACE—SNAP 9A (1963). 12 minutes, color.

Produced by the Martin Company. For sale by Byron Motion Pictures, at $37.26 per print, including shipping case. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

Semitechnical film for high-school- and college-level audiences. After showing the launching of a new satellite, which is being wholly powered by a nuclear generator, animation is used to explain the use of its isotopic generator to create power to run electronic equipment, recording equipment, and transmit data back to earth for analysis. The advantages of the nuclear energy generator are shown over the use of chemical energy and solar energy. The principles of power generation by isotopic decay are explained, showing how thermocouples convert the decaying isotopes' heat directly to electricity. A comparison of the isotopes plutonium-238 and curium-242, both used in SNAP isotope power systems, is made. The film discusses the design features of the SNAP-9A which are the result of 7 years of research. Safety tests of the isotope capsule, including explosion tests, fire tests, impact tests, and re-entry tests, are shown.

NUCLEAR REACTOR SPACE POWER SYSTEMS (A Geneva—1964 film). 8 minutes, color.

Produced by Atomics International. For sale by Byron Motion Pictures, in English, French, Spanish, or Russian, at $24.53 per print, including shipping case, F.O.B. Washington, D. C. English version available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

A technical film that summarizes the program to develop nuclear reactor power supplies for large space vehicles. Fabrication and testing of a 500-watt thermoelectric system, a 3,000-watt turboelectric system, and a reactor for a 35,000-watt turboelectric system are highlighted. Also featured is a 300—1,000-kwe turboelectric system. The reliability, high power levels, long unattended operating life, and safety characteristics of space nuclear power systems are reviewed. These units are being developed for the USAEC by Atomics International and Pratt & Whitney.

NUCLEAR REACTORS FOR SPACE (1961). 17 minutes, color.

Produced by Atomics International for the USAEC. For sale by

Byron Motion Pictures, at $54.05 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries and Atomics International, P. O. Box 309, Canoga Park, Calif. Cleared for television.

The SNAP program is a USAEC program to develop long-lived auxiliary power from nuclear energy for use in satellites and space vehicles. Compact atomic reactors being developed by Atomics International for use in SNAP systems are shown in this semitechnical film. Safety characteristics of the SNAP reactor during fabrication, testing, transport, installation, launching, and use in space are described. Detailed sequences filmed at Atomics International on fabrication and testing show the simplicity and compactness of the reactors. Safety features are described in scenes that illustrate shipping, launch-site activities, and launch of the reactor into space. The burnup and dispersal of the reactor during reentry into the atmosphere are shown in a detailed animation sequence. Many beneficial uses of SNAP in the U. S. national space program are illustrated.

OUR NEAREST STAR (Isotopic Power System for the Transit Satellite) (1961). 12 minutes, color.

Produced for the USAEC by Martin Company, Nuclear Division. For sale by Byron Motion Pictures, at $48.26 per print, including shipping case. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

A SNAP isotopic-power system has been placed in orbit aboard the Transit Four-A navigation satellite. This simple, powerful device is the first application of nuclear power in space. The system, which powers two of Transit's four navigation radio transmitters, is designed to operate for five years or more. Against a background of the Transit Program, this semitechnical film follows the development testing of the radioisotope fuel capsule and the thermoelectric generator that make up this SNAP system. The film shows the Thor-Able-Star gantry at Cape Kennedy as the SNAP unit is mounted on Transit, and, when the system is launched, the view is from the blockhouse and the launch pad.

PAX ATOMIS: SNAP-7 TERRESTRIAL ISOTOPIC POWER SYSTEMS (1965) 25 minutes, color.

Produced for the USAEC by the Martin Company, Baltimore. For sale by Gerald Productions, at $90.64 per print, including shipping case, F.O.B. New York City. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

A film useful to both high school and college groups summarizes the parallel development of a family of fully shielded thermoelectric power converters and chemical processing of the radioisotope strontium-90 fuel. Laboratory procedures are depicted for thermoelectric couple

assembly into a compact operating system capable of converting heat energy into electrical current without the need for moving parts. Compacting of strontium-90 raw material into ceramic titanate pellets and encapsulation of the fuel pellets into high strength metal containers is illustrated.

Installation of the SNAP-7 generator family—to power unattended weather stations in Antarctica and the Gulf of Mexico, navigational aids to shipping in Chesapeake Bay and the Gulf of Mexico, deep sea acoustic research in the Atlantic Ocean—is depicted by means of film footage obtained during actual installation and implantment at the operating sites. Fully shielded strontium-90 fueled, thermoelectric generators have been placed into operational service at remote outposts from north of the Arctic Circle to the South Pole. Developed by the U. S. Atomic Energy Commission under the SNAP (Systems for Nuclear Auxiliary Power) program, they are now proving the feasibility of reliable, unattended electrical power production from heat generated by decay of radioisotopes.

The film concludes with a description of current development work and predictions relating to the next generation of strontium-90 thermoelectric power supplies for terrestrial uses.

RFD-2 (1965). 14 minutes, color.

Produced for the USAEC by the Sandia Corporation. For sale by Calvin Productions, Inc., at $40.53 per print, including shipping case, F.O.B. Kansas City, Missouri. Available for loan (free) from USAEC headquarters and field libraries. NOT cleared for television.

This film outlines the design and test work performed by Sandia Corporation in assessing the nuclear safety aspects of a SNAP-19 type isotopic generator designed to supply electrical power in certain communications satellites. The film describes the flight of an inert reactor aboard a Scout rocket to investigate the burnup and disassembly of the dummy reactor upon re-entry. Shown are the instrumentation systems developed by Sandia to transmit to ground-based receiving stations information on the burnup of the reactor and its fuel rods.

The pre-flight test program conducted at Sandia, and shown in the film, included ejection tests of fuel rod experiments, tests on the flotation system designed to recover the test vehicle from the ocean, radiant heat testing of the protective shell of the vehicle, and acoustic noise tests to simulate rocket motor noise and vibration.

Some scenes at the tracking and data-recording station on Bermuda precede the film report of the launch and re-entry of the dummy reactor. A brief analysis is made of data gained from the test program to summarize the efforts being made to minimize the hazard of using reactors and isotopic generators in space applications.

SNAP-III OPERATIONAL TESTS (1960). 18 minutes, color.

Produced for the USAEC by Martin Company, Nuclear Division. For sale by Byron Motion Pictures, at $62.37 per print, including shipping case. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This semitechnical film describes operational tests (vibration, shock, acceleration, fire, explosion, land and sea impact, effects of salt water, aerodynamic heating, etc.) on the 4-lb SNAP-III isotopic-power unit, which uses ^{210}Po to generate more than 3 watts as a source of auxiliary power for space vehicles. Conclusion: SNAP-III will operate effectively on launch and in orbit.

SNAPSHOT (1965) 29 minutes, color.

Produced for the USAEC by Atomics International. For sale by General Film Laboratories, at $85.00 per print, including shipping case, F.O.B. Hollywood. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

Useful for both popular-level and technical audiences, this film, introduced with a statement by Dr. Glenn T. Seaborg, Chairman of the USAEC, describes the scheduled flight test in space of the 500-watt SNAP-10A nuclear space power system. SNAP-10A will be mated to the forward end of an Atlas-Agena booster system and launched from Vandenberg Air Force Base, California. Primary objective of the SNAPSHOT flight, a cooperative effort of the U. S. Atomic Energy Commission and the U. S. Air Force, is to obtain technical information and demonstrate the utility of nuclear reactor power systems for application in America's space programs. Atomics International is the Atomic Energy Commission's prime contractor for SNAP-10A development. Orbital startup and operation in space of the reactor and the thermoelectric power converter is explained by animation. Highlighted in this film is the extensive development and testing program which has resulted in the flight-ready SNAP-10A power system. A series of qualification system tests, including a full-scale nuclear system ground test in a simulated space environment, are reviewed and summarized. This series of tests duplicated the environments the flight system will endure through factory assembly, shipping, launch, and orbit operation. The film explains the need for SNAP reactor power systems in current and future space projects.

SNAPTRAN 2/10A WATER IMMERSION TEST . . . . See page 71

VELA

VELA PROGRAM: SATELLITE DETECTION SYSTEM (1964). 17½ minutes, color.

Produced by the Sandia Corporation for the Advanced Research

Projects Agency of the Department of Defense and the USAEC. For sale by Calvin Productions, at $47.83 per print, including shipping case, F.O.B. Available for loan (free) from USAEC headquarters and field libraries. NOT cleared for television.

This technical film explains the nature of the atmosphere surrounding our planet and the problems involved in analyzing nuclear explosions beyond the earth's atmosphere. Describing the basic circuits and problems involved in developing a series of satellites for detecting nuclear radiation, it further illustrates the manufacturing and testing of the detection system and summarizes the future of the satellite detection program.

AGRICULTURE

NON-ROOT FEEDING OF PLANTS (1958). 21 minutes, color.

Produced by Colmes-Werrenrath Productions, Chicago, for Michigan State University and the USAEC. For sale by Consolidated Film Industries, at $67.07 per print, including shipping case, F.O.B. Los Angeles, Calif. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

The techniques of applying nutrients to the aboveground parts of plants and the method of tracing the nutrients through the plant's system by means of radioisotopes are shown in this film.

RADIOISOTOPES IN AGRICULTURAL RESEARCH (Radioisotopes Series) . . . . . See page 77

RADIOISOTOPES IN BIOLOGY AND AGRICULTURE (Understanding the Atom Series) . . . . . See page 82

BIOLOGY AND MEDICINE

ACROMEGALY (Diagnosis–Etiology–Therapy) (1965). 23 minutes, color.

Produced by Donner Laboratory and the USAEC's Lawrence Radiation Laboratory. For sale by W. A. Palmer Films, Inc., at $88.48 per print, including shipping case, F.O.B. San Francisco. Available for loan (free) from USAEC headquarters and field libraries. NOT cleared for television.

This technical film for professional audiences describes the successful application of heavy particle radiation, obtained from high energy cyclotrons for treatment of the comparatively rare disease, acromegaly. Work at Donner Laboratory in Berkeley with the 184-inch

synchrocyclotron for treatment of acromegalic patients is described. Detailed procedures for preparing the patient and irradiating the pituitary gland are shown. Symptoms, diagnosis, etiology, and medical history and medical treatments also are discussed.

THE ATOMIC APOTHECARY (1954). 38 minutes, black and white.

Produced by Medical Film Guild, New York. Rental or purchase from the producer: rental, $17.50; purchase, $295.00, no shipping case included. Available for loan (free) only from USAEC headquarters. Owing to the limited number of prints, it is suggested that industrial organizations obtain the film from the Medical Film Guild and that nonprofit and educational organizations and institutions obtain the film from the USAEC. Bookings from the USAEC should be made in advance for brief periods. NOT cleared for television without express permission of the producer.

Film discusses radioisotope research in biology and medicine, including research in radioactive dust, calcium absorption in animals, and effects of radioiodine in their diet; use of astatine, effect on blood flow, oxygen tension studies, radioactive iron in bone marrow, arteriosclerosis, and use of cysteine.

ATOMS FOR THE AMERICAS . . . . . See page 13

CHROMOSOME LABELING BY TRITIUM (1958). 15 minutes, color.

Produced by the Jam Handy Organization, Detroit, for the USAEC. For sale by Byron Motion Pictures, at $53.83 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This film discusses the advantages of tritium over other radioisotopes as labeling material in autoradiography.

COBALT-60 RELOADING (1958). 8 minutes, color.

Produced by George Tressel Productions, Chicago, for the USAEC. For sale from Byron Motion Pictures, at $28.37 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

Describes the unloading of a ^{60}Co capsule from the Materials Testing Reactor at the National Reactor Testing Station in Idaho, monitoring and packing for shipment, subsequent loading of the same capsule as the radioactive source into a teletherapy machine at the Argonne Cancer Research Hospital, Chicago.

COUNTING WHOLE BODY RADIOACTIVITY (A Geneva–1964 film). 11 minutes, color.

Produced by Donner Laboratory and the USAEC's Lawrence Radiation Laboratory at the University of California. For sale by Byron Motion Pictures, in English, French, Spanish, or Russian, at $29.86 per print, including shipping case, F.O.B. Washington, D. C. English version available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

As sensitive instruments have been developed to measure lower and lower levels of radioactivity within the human body, these instruments have assumed a greater role in medical research and diagnosis. This technical film shows the Donner Laboratory Whole Body Counter, and outlines its program of use, with special reference to studies concerned with the iron metabolism of red blood cells and with calcium turnover in various diseases.

DIAGNOSIS AND THERAPY WITH RADIATION (A Geneva–1964 film). 32 minutes, color.

Produced by USAEC's Argonne National Laboratory. For sale by Byron Motion Pictures, in English, French, Spanish, or Russian, at $91.04 per print, including shipping case, F.O.B. Washington, D. C. English version available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

The film describes radiation techniques of diagnosis and therapy which have become standard medical tools in the United States. The use of radioactive iodine for thyroid studies is routine, and many other metabolic measurements are common. Development of techniques to study kidney function and blood diseases have been particularly effective. Some clinics are now equipped to prepare and measure labeled gases and extremely short-lived isotopes. Diagnostic radiation levels have been reduced to the same order of magnitude as X-ray studied. By using appropriately labeled materials it is possible to visualize many organs which are difficult or impossible to examine with X-rays. This film describes current techniques of radiation therapy through doses of radioactive chemicals, implanting techniques, and the use of external beams.

HEAVY PARTICLE BEAMS IN MEDICINE (A Geneva–1964 film). 11 minutes, color.

Produced by Donner Laboratory and the USAEC's Lawrence Radiation Laboratory at the University of California. For sale by Byron Motion Pictures, in English, French, Spanish, or Russian, at $30.81 per print, including shipping case, F.O.B. Washington, D. C. English version available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

The technical film gives a brief historical development of the medical uses of cyclotrons and shows the unique properties of accelerator-produced heavy particles both in investigative studies and in radiation therapy. Experience at the Donner Laboratory shows that this new tool of nuclear medicine when used in pituitary irradiation provides creditable results in the treatment of acromegaly, Cushing's disease, and the retardation of diabetic retinitis. In addition, the Bragg effect of alpha particle radiation is of increasing importance in direct treatment of tumors of the brain and soft tissue.

HUMAN RADIOACTIVITY MEASUREMENTS (1958). 9 minutes, color.
Produced by USAEC's Los Alamos Scientific Laboratory. For sale by Byron Motion Pictures, at $29.36 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters, field libraries, and Los Alamos Scientific Laboratory, P. O. Box 1663, Los Alamos, New Mexico. Cleared for television.

This film shows a method developed at Los Alamos Scientific Laboratory to monitor personnel exposed to the possible intake of gamma-emitting materials and to study the retention and excretion of radioactive isotopes by the body. The liquid scintillation counter is large enough to contain a man and sensitive enough to detect even the minute amounts of his natural gamma radioactivity.

IODINE-131 (1958). 15 minutes, color.
Produced by the Jam Handy Organization, Detroit, for the USAEC. For sale by Byron Motion Pictures, at $55.56 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This film shows the diagnostic and therapeutic uses of the radioisotope ^{131}I for hyperthyroidism, thyroid cancer, and heart disease. The characteristics, techniques, and results are discussed, as well as the problems of standardization and calibration of scanning devices for ^{131}I, which is probably the most used isotope in the field of medicine.

IONIZING RADIATION IN HUMANS (1958). 15 minutes, color.
Produced by USAEC's Argonne National Laboratory. For sale by Byron Motion Pictures, at $50.30 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters, field libraries, and Argonne National Laboratory, 9700 South Cass Ave., Argonne, Ill. 60440. Cleared for television.

This film shows the design and operation of Argonne National Laboratory's whole-body counter for determining identification, quantity, and location of internally deposited radioelements. Various techniques in

accumulation of data, the tilting chair, one meter arc, and collimating the crystal are also shown.

LIQUID SCINTILLATION COUNTING (1958). 14 minutes, color.

Produced by the Jam Handy Organization, Detroit, for the USAEC. For sale by Byron Motion Pictures, at $50.95 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This film describes the use of a liquid scintillator for counting low-energy beta emitters commonly used in biological and medical tracer experiments. It also explains the advantages of the single- and double-photomultiplier tube liquid scintillation counters over the solid-phase and gas-phase counters, e.g., ease of sample preparation, high efficiency, and excellent sensitivity. The film describes counting techniques, how the counters work, and how a sample is prepared. Liquid scintillation counting is an extremely useful technique, particularly for weak beta emitters, such as ^{14}C and tritium, where the number of samples to be counted places a premium on the ease of sample preparation.

MEDICAL RESEARCH REACTOR (1958). 22 minutes, color.

Produced by Audio Productions, New York, for USAEC's Brookhaven National Laboratory. For sale from Byron Motion Pictures, at $70.95 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters, field libraries, and Brookhaven National Laboratory, Upton, Long Island, N. Y. Cleared for television.

Prepared primarily for those concerned with the design and utilization of reactors for medical research, this film demonstrates the need for such a reactor and defines the design criteria. The reactor and its components are shown during construction and assembly. Operation of the reactor and shutters controlling its neutron beams are shown by animation. There is also a neutron-capture therapy experiment sequence at the Brookhaven graphite reactor which can be compared with the patient treatment facility at the new medical reactor.

MODIFICATION OF RADIATION INJURY IN MICE (1958). 10 minutes, color.

Produced by the Jam Handy Organization, Detroit, for the USAEC. For sale by Byron Motion Pictures, at $36.33 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This film shows the effects on mice of chemical protection by mercaptoethylguanidine (MEG) before irradiation and bone-marrow trans-

plant after exposure to lethal doses of 900 r, as well as possible implications regarding treatment of some human diseases. The irradiation that kills 50 per cent of mice in 30 days can be doubled with MEG protection and nearly doubled with bone-marrow treatment. With chemical protection followed by bone-marrow treatment, the dose of irradiation that it takes to kill 50 per cent of mice in 30 days can nearly be tripled. MEG reduced the effect of a lethal dose of 900-r X irradiation on the bone marrow, spleen, thymus, and body weight by about a factor of 2. MEG is not effective when given after irradiation. Bone-marrow injection was primarily responsible for replacing the destroyed bone marrow. It is not effective when given before irradiation. In combined treatment, the animal received the advantages of both types of therapy and survived much greater exposure.

PHYSICAL PRINCIPLES OF RADIOLOGICAL SAFETY (Radioisotopes Series) . . . . . See page 75

RADIATION PROTECTION IN NUCLEAR MEDICINE (1962). 45 minutes, color.

Produced by Fordel Films, New York, for the Bureau of Medicine and Surgery of the U. S. Navy. Sale inquiries should be directed to the Naval Photographic Center. Available for loan (free) from USAEC headquarters and field libraries, and from the Medical Film Section, Audio-Visual Division, Naval Medical School, Bethesda, Md. 20545. Naval personnel can borrow the film from appropriate naval film libraries. Cleared for television.

This semitechnical film demonstrates the procedures devised for naval hospitals to protect against the gamma radiation emitted from materials used in radiation therapy. However, its principles are applicable in all hospitals. The practices demonstrated are based on three principles established at the outset. The film explains the nature of gamma radiation relative to how time, distance, and shielding are used to provide protection from its harmful effects. Time is considered in two ways: (1) the half life of the radioactive materials used and (2) the speed in handling them. The film shows the continuous application of these principles from the moment radioactive materials are received at a hospital, through their storage, their preparation for use, their therapeutic administration, the nursing care of radioactive patients, and the disposal of radioactive human waste. The film details the special techniques and equipment used in the handling of radium and radioactive gold, iodine, and iridium as representing the variety of such materials that hospital personnel encounter and the consequent variations in time, distance, and shielding employed as protection against them. The use of monitoring devices and the maintenance of records of their readings form a recurrent theme throughout the film.

It makes the dual point that radiological-safety records are used (1) to provide immediate protection for hospital personnel and (2) as a basis on which the staff can reevaluate and improve techniques, always with the purpose of keeping the exposure of each person below the established maximum permissible levels.

RADIOISOTOPE APPLICATIONS IN MEDICINE (Understanding the Atom Series) . . . . . See page 81

THE RADIOISOTOPE IN GENERAL SCIENCES (Radioisotopes Series) . . . . . See page 76

THE RADIOISOTOPE: METHODOLOGY (Radioisotopes Series) . . . . . See page 77

RADIOISOTOPES IN BIOLOGY AND AGRICULTURE (Understanding the Atom Series) . . . . . See page 82

RADIOISOTOPES: THEIR APPLICATION TO HUMANS (1954). 32 minutes, color.

Produced by Medical Film Guild, New York. Rental or purchase from the producer: rental, $17.50; purchase, $335.00, no shipping case included. Available for loan (free) only from USAEC headquarters. Owing to the limited number of prints, it is suggested that industrial organizations obtain the film from the Medical Film Guild and that nonprofit and educational organizations and institutions obtain the film from the USAEC. Bookings from USAEC should be made in advance for brief periods. NOT cleared for television without the express permission of the producer.

This film is a comprehensive review of the uses of radioisotopes in human applications as tracer studies and for therapeutic use. Uses of radioactive iodine, sodium, iron, calcium, lanthanum, strontium, cobalt, phosphorus, gold, and the neutron-capture therapy involving boron for treatment of brain tumors are also discussed.

RADIOPHARMACEUTICALS: FROM REACTOR TO PHYSICIAN (1958). 20 minutes, color.

Produced by the Jam Handy Organization, Detroit, for Abbott Laboratories. For sale information, contact Abbott Laboratories. Available on loan (free) from Department of Radio-Pharmaceuticals, Abbott Laboratories, North Chicago, Ill. 60064. NOT cleared for television without the express permission of Abbott Laboratories.

This film illustrates the purification and processing of radioisotopes to render them suitable for use by the physician. Emphasis is placed upon

the production of various radiopharmaceuticals in encapsulated form, together with methods used for their assay and standardization. A clinical section deals with the newest methods of thyroid uptakes, new iodine therapy, and the use of Racobalamin (R) (radiocyanocobalamin) and Raolein (radioiodinated triolein) for the diagnosis of pernicious anemia and faulty fat absorption, respectively.

THE SCINTILLATION CAMERA (A Geneva–1964 film). 10 minutes, color.

Produced by Donner Laboratory and the USAEC's Lawrence Radiation Laboratory at the University of California. For sale by Byron Motion Pictures, in English, French, Spanish, or Russian, at $29.35 per print, including shipping case, F.O.B. Washington, D. C. English version available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

In order to visualize the location of gamma-emitting isotopes within the human body for medical diagnostic purposes, the scintillation camera was developed at the Donner Laboratory. Using animation, this technical film describes this equipment and explains the application of the method for studying thyroid and kidney function disorders. It also describes a modified apparatus for use with positron-emitting isotopes which has been developed and finds a particular advantage in diagnosis of brain tumors.

TELETHERAPY AND BRACHYTHERAPY (1958). 18 minutes, color.

Produced by the Jam Handy Organization, Detroit, for the USAEC. For sale by Byron Motion Pictures, at $66.98 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This film shows the diagnostic and therapeutic uses of such radioisotopes as ^{60}Co, ^{137}Cs, $^{152-154}Eu$, ^{131}I, and ^{90}Y in teletherapy and brachytherapy by using machines that aim a high-energy beam at a tumor or by using implants of radioactive materials in the form of needles, beads, sterile tubing, seeds, etc.

EDUCATION

ATOMS FOR THE AMERICAS (1963). 28 minutes, color.

Produced for USAEC's Oak Ridge Operations Office by Orleans Film Productions, Knoxville. For sale by Byron Motion Pictures, at $76.66 per print, including shipping case. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This semitechnical film offers an extensive tour of the facilities of the Puerto Rico Nuclear Center (operated for the USAEC by the University of Puerto Rico) and a study of the Center's curricula and research programs. The Center was conceived primarily to aid the Latin American nations in developing skills essential to nuclear energy activity, by providing graduate- and postgraduate-level education and research opportunities. At the Center's Bio-Medical building, work is shown involving radioisotopes and their clinical applications, and other nuclear work related to biology, chemistry, and medicine is reviewed. Study and research in nuclear engineering and technology, health physics, agriculture, and marine biology are shown at the Center's reactor and laboratories located on the campus of the University of Puerto Rico's College of Agriculture and Engineering, and aboard the Center's oceanographic ship.

INTRODUCTION TO ANALOG COMPUTERS (1963). 2 hours, color.

Produced by USAEC's Argonne National Laboratory. For sale by Byron Motion Pictures, at $344.36 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) only from USAEC headquarters in Washington and from Argonne National Laboratory, 9700 South Cass Ave., Argonne, Ill. (especially for loans west of Chicago). Cleared for television.

This two-hour, three-part technical lecture-film (approximately 40 minutes per part) by Dr. L. C. Just of Argonne's Applied Mathematics Division includes: (1) components of electronic analog computers, (2) familiarization with a typical analog computer, (3) programming for analog computers, and (4) solution of typical problems.

TECHNICAL INFORMATION SERVICES OF THE AEC (1961). 20 minutes, color.

Produced by the U. S. Department of Agriculture, Motion Picture Service, under supervision of the USAEC's Division of Technical Information. For sale by the producer, at $92.00 per print, including shipping case. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This film, presented in nontechnical language, surveys what is available in the unclassified atomic energy literature and discusses how the information can be located, obtained, and used. The film, which describes in detail the services of the USAEC's Division of Technical Information, holds special interest for librarians, engineering and scientific groups, research and development organizations, and teachers and students at the senior high-school level and above. The film gives a brief look at the forms in which atomic energy information becomes available: research and development reports, technical progress reviews, bibliographies, technical books, translations, papers presented at professional meetings, engineering materials, other spe-

cial publications, and films. It reviews in some detail *Nuclear Science Abstracts*, the only unclassified journal devoted solely to announcing and abstracting atomic energy scientific and technical literature published throughout the world. The viewer learns also of the various bibliographies that are prepared on specialized subjects and of special literature searches that are provided by the USAEC at a nominal rate. The film details the wealth of information available at 84 domestic and 83 foreign USAEC depository libraries located throughout the world. The availability on microcards of all technical information offered by the USAEC, including that published in more than 30,000 USAEC research and development reports, is explained. Also described is the USAEC's sponsorship of a technical book-writing program, the exchange of technical information with other nations, an active program for translating foreign monographs, publication of quarterly Technical Progress Reviews for the use of industry, the reproduction of engineering drawings and related information, and the production and distribution of motion pictures on atomic energy which are designed to serve either professional or general audiences.

ENGINEERING

ACCEL: AUTOMATED CIRCUIT CARD ETCHING LAYOUT (1965). 20 minutes, color.

Produced for the USAEC by Sandia Corporation. For sale by Filmservice Laboratories, Inc., at $60.23 per print, including shipping case, F.O.B. Hollywood. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

ACCEL is a computer program which designs printed circuit boards and produces the drawings for their construction with the input encoded from an engineer's schematic diagram by a clerk without knowledge of electronics. The outputs of the program are a schematic, parts list, printed circuit negative, assembly drawing, and a hole drilling list. ACCEL is written in Fortran II for the IBM 7090 computer and the drawings are produced on the Stromberg Carlson 4020 cathode ray tube plotter.

The film describes the operational aspects of the system, as well as the unusual algorithms used to accomplish the design feat.

Two items of major significance are: (1) the "force placement" algorithm for determining component location; and, (2) the modification of Lee's algorithm used for finding the routing paths.

CLEAN AIR IS A BREEZE (Airborne Contamination Control Through Laminar Air Flow) (1965). 16 minutes, color.

Produced by the Sandia Corporation for the USAEC. For sale by Calvin Productions, Kansas City, Mo., at $43.52 per print,

including shipping case, F.O.B. Kansas City, Mo. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

Common sources of airborne contamination are illustrated to show that our world is contaminated by a variety of airborne particles. The difficulties of manufacturing precision devices in such a "dirty" world are shown. The tiny sizes of particles which cause problems in delicate assembly work and critical industrial processes are illustrated through animated photography. Earlier attempts to clean air for industrial processes by means of clean rooms are shown. The reasons for less than complete success with standard clean rooms are explained through animation, and the theory and basic operating principles of laminar airflow systems are shown. The variety of laminar airflow devices (various clean rooms and clean benches) now available is shown. Application of such devices to industrial processes, research and development problems, and to the field of medical care and medical research is illustrated. A short recapitulation points out that laminar flow devices make possible the clean work which must continue in spite of the contamination present in the world.

ENVIRONMENTAL TESTING AT SANDIA (1964). 28 minutes, color.

Produced by the Sandia Corporation for the USAEC. For sale by Calvin Productions, Kansas City, Mo., at $73.07 per print, including shipping case, F.O.B. Kansas City, Mo. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

Discussing the environments, both natural and induced, which weapon components and systems may experience between manufacture and use, this technical film shows how environmental testing is used to ensure reliability. A series of test sequences enables the audience to see some of the facilities at USAEC's Sandia Laboratory: giant centrifuge, electrodynamic shaker, rocket sled, air gun, climatic chamber, etc.—which are used to produce varying environments. The film will be of interest to military and civilian engineers, as well as scientists and technicians associated with the weapons program. It will also be of interest to general nontechnical audiences of high school level and above.

FUNDAMENTALS OF MECHANICAL VIBRATION (1964). 29 minutes, color.

Produced by the Sandia Corporation for the USAEC. For sale by Calvin Productions, Kansas City, Mo., at $76.39 per print, including shipping case, F.O.B. Kansas City, Mo. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This technical film for engineers and engineering students discusses

the simple systems of mechanical vibration, including spring mass, viscous coulomb, and solid damped systems. The various types of damping are illustrated by live demonstrations and animation. In addition, animated mathematical examples by Fourier are used to illustrate irregular forcing functions and their effects on engineering structures. The mathematical approach to solving composite displacement vibration problems is also discussed.

FUELS, PROCESSING, AND METALLURGY

ADVENTURES IN METALLURGY (1957). 22 minutes, color.

Produced by the Hanford Atomic Products Operation, General Electric Company, as contractor for the USAEC at Hanford Works, Richland, Washington. For sale by Byron Motion Pictures, at $71.89 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters, field libraries, and Hanford Atomic Products Operation, Richland, Wash. Cleared for television. [NOTE: This film is slightly longer but similar to the 17-minute film, "Microdeformation of Uranium," which is also available for loan, see page 21.]

This technical film, primarily of interest to metallurgists, is a study of the room-temperature deformation and fracture in uranium as seen in the optical microscope. Strain energy accelerates the formation of uranium oxide film on the specimen's surface. As a result, the microstructure is revealed by interference colors that facilitate interpretation.

CERAMIC FUEL FABRICATION DEVELOPMENT FOR PRTR (1962). $26\frac{1}{2}$ minutes, color.

Produced by the Hanford Atomic Products Operation, General Electric Company, as contractor for the USAEC at the Hanford Works, Richland, Washington. For sale by W. A. Palmer Films, at $144.12 per print, including shipping case, F.O.B. San Francisco. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This film gives a detailed technical explanation of three processes developed by Hanford laboratories for the fabrication of UO_2 fuel elements used in the Plutonium Recycle Test Reactor (PRTR). A brief summary of the purpose and history of the PRTR introduces studies of cold swaging, hot swaging, and vibrational compaction. Four significant phases of the fabrication processes are detailed in live and animated sequences: (1) ultrasonic testing of cladding tubes; (2) swaging to increase the bulk density of contained UO_2 powder; (3) magnetic-force resistance butt welding of fuel-rod end caps; and (4) final inspection

steps, including the measurement of fuel density by gamma-ray attenuation. Vibrational compaction is shown to be particularly adapted to loading fuel into large fuel-element components and into preassembled multicomponent fuel elements. Hot swaging of induction heated rods containing powdered UO_2 is also illustrated.

CURRENT METHODS IN PLUTONIUM FUEL FABRICATION (1965). 30 minutes, color.

Produced by the Hanford Atomic Products Operation, General Electric Company, as contractor for the USAEC. For sale by W. A. Palmer Films, at $140.46 per print, including shipping case, F.O.B. San Francisco. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This film depicts the steps currently (December 1964) employed in the fabrication of plutonium–uranium ceramic fuel elements for the PRTR and EBWR at Hanford's Plutonium Fabrication Pilot Plant. Presented are the various types of elements fabricated, the methods for the routine handling of plutonium and plutonium compounds, the preparation of plutonium dioxide from the metal, and its mixture with uranium dioxide. The necessity for densifying the powdered fuel is explained, and the steps involved in achieving high density particles by pneumatic impaction are illustrated in detail. Processes shown include pressing of the dense fuel from the impaction container, pulverizing, sieving into different size fractions, and blending into appropriate proportions for fuel rod fabrication either by vibrational compaction or swaging. Swaging, a process for simultaneously compacting and cladding ceramic fuels to form high density fuel rods, is fully illustrated, both in live and animated sequences. A newer process, vibrational compaction, accomplishes similar results. The process is depicted in a live sequence which illustrates its rapidity, simplicity, and flexibility. Decontamination of loaded fuel rods and welding of the final end caps are followed by several unconventional testing techniques before assembly of the rods into the nineteen-rod nuclear fuel element cluster. The processes and equipment that are shown for the fabrication of plutonium–uranium oxide fuel elements are expected to find major application in the commercial fabrication of plutonium bearing fuel elements for central station power reactors, space reactors, and other special purposes in which plutonium fuels can be used to advantage.

EBR-I CORE DISASSEMBLY AFTER MELTDOWN (1958). 13 minutes, color.

Produced by USAEC's Argonne National Laboratory. For sale by Byron Motion Pictures, at $42.31 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters, field libraries, and Argonne National

Laboratory, 9700 South Cass Ave., Argonne, Ill. Cleared for television.

This film presents some major aspects of the removal and subsequent disassembly of the core of Experimental Breeder Reactor-I, Mark II, following meltdown. It illustrates the hot-laboratory remote-control techniques used to separate and recover enriched fuel from the blanket material.

EBR-II FUEL CYCLE DEVELOPMENT (1958). 9 minutes, color.

Produced by USAEC's Argonne National Laboratory. For sale by Byron Motion Pictures, at $34.41 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters, field libraries, and Argonne National Laboratory, 9700 South Cass Ave., Argonne, Ill. Cleared for television.

This film presents some major aspects of the development, in progress of a completely integrated fuel cycle for Experimental Breeder Reactor-II and includes the remote handling, reprocessing, refabrication, and reassembly of an EBR-II fuel element.

EBR-II FUEL FACILITY (A Geneva–1964 film). 13 minutes, color.

Produced by USAEC's Argonne National Laboratory. For sale by Byron Motion Pictures, in English, French, Spanish, or Russian, at $40.98 per print, including shipping case, F.O.B. Washington, D. C. English version available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

The technical film shows how, in this facility, coupled to the Experimental Breeder Reactor-II, highly radioactive fuel from the reactor is disassembled, reprocessed, and fabricated, without prior time-consuming radioactive cooling periods. How all facets of the system are designed for remote operation, repair and modification of equipment is also shown.

FABRICATION OF PLUTONIUM DISKS (1958). 13 minutes, black and white.

Produced by USAEC's Los Alamos Scientific Laboratory. For sale by Byron Motion Pictures, at $14.91 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters, field libraries, and Los Alamos Scientific Laboratory, Los Alamos, New Mexico. Cleared for television.

This is a companion film to "Plutonium Metal Preparation" (see page 23). The film describes glove box work used at Los Alamos Scientific Laboratory (LASL) in shaping toxic material for criticality studies in reactor development. Disks are 6 in. in diameter and $\frac{1}{8}$ in. thick.

Two methods of fabrication are shown: (1) blanking the disks from sheet stock made by tube extrusion and (2) shaping disks by standard machining techniques. Because of the pyrophoric nature of plutonium, a great deal of the work is done in an inert atmosphere. The ever-present problems of personnel exposure and area contamination are met with a system of operation that has been developed over 16 years.

FABRICATION OF RESEARCH REACTOR FUEL ELEMENTS (1958). 20 minutes, color.

Produced by USAEC's Oak Ridge National Laboratory. For sale by Byron Motion Pictures, at $73.61 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters, field libraries, and Oak Ridge National Laboratory, Oak Ridge, Tenn. Cleared for television.

This technical film describes the alloy and powder metallurgy methods of fabricating research reactor fuel elements.

FABRICATION OF THE ACCELERATOR STRUCTURE . . . . . See page 33

FUEL FABRICATION FACILITY (1959). 9 minutes, color.

Produced by USAEC's Argonne National Laboratory. For sale by Byron Motion Pictures, at $26.72 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters, field libraries, and Argonne National Laboratory, 9700 South Cass Ave., Argonne, Ill. 60440. Cleared for television.

This technical film describes Argonne National Laboratory's fabrication process developments laboratory for the manufacture of unique fuel elements and test pieces containing the highly radioactive and chemically toxic element plutonium. The film shows many special features that are incorporated to ensure the protection of operating personnel and to permit flexibility in the type application of the fabricating procedures.

ISOTOPES (1959). 20 minutes, color.

Produced by USAEC's Oak Ridge National Laboratory. Animation sequences by Wilding Productions, Chicago. For sale by Capital Film Laboratories, at $76.85 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters, field libraries, and Oak Ridge National Laboratory, Oak Ridge, Tennessee. Cleared for television.

This film describes the production of stable isotopes and radioisotopes and the separation of fission products. The first part of the film explains, in layman's language, radioactivity, half life, and the three

methods of producing radioisotopes. Live photography and animation tell the story of radioisotopes production at the Oak Ridge National Laboratory (ORNL). The remainder of the film explains in semitechnical language, the large-scale separation of long-life fission products at ORNL's pilot plant. Animation illustrates in detail the separation of fission products from wastes derived during the processing of spent reactor fuels.

METALS FRONTIER (1961). 22 minutes, color.

Produced by Iowa State University Film Production for the Iowa State University Institute for Atomic Research and the Ames Laboratory of the USAEC. For sale by Iowa State University, at $75.48 per print, including shipping case. Available for loan (free) from USAEC headquarters and field libraries and the Visual Instruction Service, Iowa State University, Ames, Iowa 50010. Cleared for television.

This semitechnical documentary film, a story of teamwork in research, is designed for an audience with an appreciable degree of scientific sophistication, primarily seniors and graduate students in the physical sciences and engineering. Highlights in the operations of the Ames Laboratory, a major installation of the U. S. Atomic Energy Commission, are shown by illustrating the steps in the development of the process for production of yttrium metal. The film also gives insight into the facilities and the pioneering tradition of Ames Laboratory in the investigation of the rare earths. The film is panoramic in style, showing how basic research, development, and production go along together. Steps in metal processing are shown as follows: separation of yttrium from rare earths, conversion to fluoride, reduction, and arc melting. Special emphasis is given to purity and to the need for careful analytical control. The film also shows how the graduate student fits into the laboratory's research program.

MICRODEFORMATION OF URANIUM (1958). 17 minutes, color.

Produced by the Hanford Atomic Products Operation, General Electric Company, as contractor for the USAEC at the Hanford Works, Richland, Washington. For sale from Byron Motion Pictures, at $60.93 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters, field libraries, and Hanford Atomic Products Operation at Richland, Washington 99352. Cleared for television. [NOTE: This film is similar to the 22-minute film, "Adventures in Metallurgy," also available on loan from the USAEC but contains slightly more technical information.]

This technical film, primarily of interest to metallurgists, pictures the changes in the microstructure of uranium as a consequence of tensile loading and thermal treatments—studies accomplished by means of

hot stage metallography. Formation of twin and kink bands, distortion at grain boundaries, fracturing, recrystallization, deformation due to thermal gradients, as well as microstructural changes associated with thermal cycling through the alpha-to-beta and the beta-to-gamma transformations, are disclosed. The commentary discusses the microstructural changes as seen in the microscope.

NOVEL METHODS OF FUEL FABRICATION (1958). 13½ minutes, color.

Produced by the Hanford Atomic Products Operation, General Electric Company, as contractor for the USAEC at the Hanford Works, Richland, Washington. For sale by Byron Motion Pictures, at $49.61 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters, field libraries, and Hanford Atomic Products Operation, Richland, Washington 99352. Cleared for television.

The first novel method covered is cold closure, a process for the cladding of solid uranium fuel in aluminum by sizing on a heavy-walled cup, then cold welding. Electron-beam welding, a process utilizing electrons accelerated through a vacuum, is illustrated, and its application to welding of many reactive metals is described. Also covered is swaging, a process that has proved to be satisfactory in fabricating clad uranium oxide fuel elements by direct compaction of loose powder.

PLUTONIUM FUEL FABRICATION, EBR-I, MARK IV (1961). 10 minutes, color.

Produced by USAEC's Argonne National Laboratory. For sale by Byron Motion Pictures, at $30.15 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters, field libraries, and Argonne National Laboratory, 9700 South Cass Ave., Argonne, Ill. Cleared for television.

Fabrication of plutonium fuel and test pieces is complicated by consideration of criticality, pyrophoricity, and radioactive toxicity. This film describes the techniques and precautions observed in manufacturing fuel for the Experimental Breeder Reactor I (EBR-I), Mark IV. Throughout the production line, plutonium is exposed only in the filtered, recirculating helium atmosphere under a slightly negative pressure. Standard criticality features are observed. Entrance or exit from the line is accomplished through multiple air locks and sealed bags. Although the EBR-I Mark-IV fuel is experimental in nature, the handling techniques and precautions are generally applicable to plutonium fabrication.

PLUTONIUM FUEL FABRICATION FOR MTR (1958). 11 minutes, color.

Produced by the Hanford Atomic Products Operation, General Electric Company, as contractor for the USAEC at the Hanford Works, Richland, Washington. For sale by Byron Motion Pictures, at $37.87 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters, field libraries, and Hanford Atomic Products Operation at Richland, Washington 99352. Cleared for television.

The Materials Testing Reactor (MTR) at USAEC's National Reactor Testing Station, Idaho, has been operated utilizing plutonium as the entire fissionable fuel charge. This technical film details the fabrication of this charge in the plutonium metallurgy laboratories of USAEC's Hanford Works, Richland, Washington. Aluminum–15 wt.% plutonium alloy was cast, hot forged, and roll-clad with aluminum for assembly into 18 plate fuel elements. These elements were used successfully at a power of 30 Mw(t) in the MTR to demonstrate for the first time the operation of a thermal reactor fueled with plutonium.

PLUTONIUM METAL PREPARATION (1958). 12 minutes, black and white.

Produced by USAEC's Los Alamos Scientific Laboratory. For sale by Byron Motion Pictures, at $12.21 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters, field libraries, and Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87115. Cleared for television.

This technical film shows the process and equipment designed and used at Los Alamos Scientific Laboratory in converting plutonium from a nitrate solution to elemental metal. Because of serious health hazards, plutonium is processed in airtight compartments, with equipment operated entirely by remote control. The isolated plutonium is used for metallurgical and pyrometallurgical research, for fuel alloy development, and for reactor and critical assembly elements.

PLUTONIUM RECYCLE (A Geneva–1964 film). 17 minutes, color.

Produced by USAEC's Argonne National Laboratory. For sale by Byron Motion Pictures, in English, French, Spanish, or Russian, at $50.91 per print, including shipping case, F.O.B. Washington, D. C. English version available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This technical film explains that the nuclear-economic advantages of plutonium depend upon the performance of multiple recycle. Various aspects of the development for both thermal and fast reactors are presented, with particular emphasis on the fuel element technology, reactor use, and chemical reprocessing associated with mixed oxides of plutonium and uranium in thermal reactors.

PRODUCTION OF URANIUM FEED MATERIALS (1959). 28 minutes, color.

Produced by Continental Productions Corp., Chattanooga, for the Oak Ridge Operations Office of the USAEC. For sale by Capital Film Laboratories, at $87.31 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This semitechnical film describes the step-by-step processing of uranium—from ore concentrates to metal reduction and fabrication—in the feed materials plants of the USAEC at Fernald, Ohio, and Weldon Spring, Missouri.

REACTOR FUEL PROCESSING (1958). 20 minutes, color.

Produced by USAEC's Oak Ridge National Laboratory. For sale by Byron Motion Pictures, at $62.71 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters, field libraries, and Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831. Cleared for television.

Describing radiochemical processing of irradiated reactor fuels, this film covers steps in chemical-separation and waste-disposal operations at pilot-plant facilities at Oak Ridge National Laboratory (Tenn.); production facilities at the National Reactor Testing Station (Idaho); Hanford Works (Richland, Wash.); and Savannah River Plant (Aiken, S. C.); and process research activities at Argonne National Laboratory (Illinois) and Oak Ridge National Laboratory.

A STUDY OF GRAIN GROWTH IN BeO USING A NEW TRANSMITTED LIGHT HOT STAGE (1965). 16½ minutes, color.

Produced for the USAEC by Atomics International. For sale by Hollywood Film Enterprises, Inc., at $42.00 per print, including shipping case, F.O.B. Hollywood. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This film report (based on ceramics technology research conducted for the Fuels and Technology Branch, Division of Reactor Development and Technology, USAEC) depicts the design and operation of a new hot stage used with a polarizing microscope and transmitted light. Time-lapse color cinematography makes possible the observation of time-dependent reactions and structural changes in transparent crystalline materials at temperatures as high as 2000°C. Sequences are shown of studies of thin sections of beryllium oxide ceramics at about 1700°C in vacuum. Movement of pores and grain boundaries, grain growth, and surface evaporation effects were seen. The film describes the physical basis for some of the observations, and the determination of quantitative grain-growth kinetics from the photographic records.

TERNARY PHASE DIAGRAM (1965). 7 minutes, color.

Produced by the USAEC's Lawrence Radiation Laboratory. For sale by W. A. Palmer Films, Inc., at $36.94 per print, including shipping case, F.O.B. San Francisco. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This technical film, primarily of interest to metallurgists, depicts the development of a new and rapid technique for preparation of ternary phase diagrams required in the search for useful alloys. Since there are more than 4,000 combinations of three-element alloys which can be made from common metals alone, a comprehensive collection of such diagrams is needed. The technique shown for determining ternary phase alloy diagrams makes it possible to circumvent a previously tedious, time consuming, and costly research procedure.

THORIUM-^{233}U UTILIZATION (A Geneva–1964 film). 13 minutes, color.

Produced by USAEC's Argonne National Laboratory. For sale by Byron Motion Pictures, in English, French, Spanish, or Russian, at $39.16 per print, including shipping case, F.O.B. Washington, D. C. English version available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This technical film discusses thorium-232 as fertile material, currently in use in three commercial power reactors, and the commercial fabrication of ceramic uraniathoria. Also shown are other fuel and reactor concepts being developed, such as the molten salt experiment, and the preparation of the first uranium-233 enriched thorium fuel by the Sol-Gel process.

INDUSTRIAL APPLICATIONS

GAUGING THICKNESS WITH RADIOISOTOPES (1958). 4½ minutes, black and white.

Produced by George Tressel Productions, Chicago, for the USAEC. For sale from Byron Motion Pictures, at $5.47 per print, including shipping case, F.O.B. Washington, D. C. Available on loan (free) from USAEC headquarters and field libraries. Cleared for television.

This brief film explains how beta gauges are used for precise measurement and control of feedback apparatus in steel, plastics, rubber, and paper manufacturing.

INDUSTRIAL APPLICATIONS OF RADIOISOTOPES (1961). 57 minutes, color.

Produced for the USAEC by the U. S. Army Pictorial Center. For sale by Byron Motion Pictures, at $160.33 per print, with shipping case. Price to Federal Government agencies is $138.22, if ordered from the Army Pictorial Center. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This semitechnical film surveys the current widespread uses of radioisotopes throughout American industry. Three major areas of use are described: nuclear gauging (thickness, density, and level), radiography, and tracing—with various examples of each filmed at 26 sites nationwide, including the rubber industry, thin strip metal production, plastics, paper mills, nylons, food canning, cement, submarine construction, oil industry, automobiles, etc. Covered briefly are luminescence, static elimination, isotopic power, and uses of high-intensity radiation. Basic principles are explained by animation, followed by examples of in-plant uses. Benefits to the consumer and manufacturer are highlighted. The excellent safety record is noted. The film, although of interest to a wide audience, is designed to acquaint industrial management with the versatility, economy, and ease with which radioisotope techniques can be adapted to plant requirements.

NEUTRON ACTIVATION ANALYSIS . . . . . See page 37

THE NUCLEAR WITNESS—ACTIVATION ANALYSIS IN CRIME INVESTIGATION (1965). 28 minutes, color.

Produced by the General Atomic Division of General Dynamics Corporation and McNamara Productions, Gateway West, Century City, Los Angeles, California, for the USAEC's Division of Isotope Development. For sale by McNamara Productions. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

Among the large number of important applications of the activation analysis method, in many fields of science, industry, and medicine, one of the newest and most promising applications is in the field of scientific crime investigation (criminalistics, or forensic studies). During the past few years, research studies have demonstrated numerous intriguing and highly valuable applications of the method to the analysis of forensic samples, i.e., physical evidence samples involved in criminal cases. Neutron activation analysis—a highly sensitive and powerful analytical technique—is a method of analyzing samples for various elements by bombarding them with neutrons, to make some of the elements radioactive, and then identifying and measuring the induced radioactivities to complete the quantitative analysis.

Because of the tremendous sensitivity of high-flux (nuclear reactor) neutron activation analysis, samples far too small to be analyzed by

the methods currently available in the usual crime laboratory (even microscopic samples) can often be successfully analyzed—and characterizing bare trace concentrations (parts per million, parts per billion, and even lower) can be accurately determined. For some 75 elements, limits of detection range from as low as 10^{-7} micrograms up to about 5 micrograms. Often, the method can be employed nondestructively.

The film describes in a fascinating but authentic manner a number of studies, based on actual criminal cases (murder, burglary, narcotics peddling)—involving the analysis of such evidence materials as gunshot residues, hair, paint, and marijuana. One case is followed from crime scene all the way through the trial in court; the other cases through the laboratory investigation.

PLOWSHARE . . . . . See page 28

RADIOISOTOPE APPLICATIONS IN INDUSTRY (Understanding the Atom Series) . . . . . See page 81

RADIOISOTOPES: SAFE SERVANTS OF INDUSTRY (1963). 28 minutes, color.

Produced by Molesworth Associates for the USAEC's Division of Isotope Development. For sale by Orleans Film Productions, Knoxville, at $88.80 per print, including shipping case, F.O.B. Knoxville, Tenn. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

With emphasis on safety, this film surveys the widespread uses of radioisotopes in industry. Animated explanations of the principles involved in radioisotope gauging instruments, tracing, and radiography are given. Applications of these principles are shown in various processes in the food industry, automotive research, road construction, heavy industry, oil refining and shipping, and system troubleshooting.

PEACEFUL USES OF NUCLEAR EXPLOSIVES (Plowshare)

CIVILIAN APPLICATIONS OF NUCLEAR EXPLOSIVES (A Geneva–1964 film). 13 minutes, color.

Produced by the USAEC's Lawrence Radiation Laboratory at the University of California. For sale by Byron Motion Pictures, in English, French, Spanish, or Russian, at $36.53 per print, including shipping case, F.O.B. Washington, D. C. English version

available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This technical film outlines the progress made in developing scientific and industrial applications for nuclear explosives. Studies of 42 nuclear explosions in a variety of media and at varying depths of burial have led to 2 general modes of application which are analyzed in some detail in the film.

INDUSTRIAL APPLICATIONS OF NUCLEAR EXPLOSIVES (1958). 11 minutes, color.

Produced by the USAEC's Lawrence Radiation Laboratory at the University of California. For sale by Byron Motion Pictures, at $34.54 per print, including shipping case, F.O.B. Washington, D. C. Available on loan (free) from USAEC headquarters and field libraries. Cleared for television.

This semitechnical film presents potential industrial applications of nuclear explosives that require amounts of packaged energy heretofore unavailable and suggests that nuclear explosives can be used as safely as chemical explosives, and with greater effect and at less cost. Applications illustrated include harbor development, economical recovery of low-grade ore bodies, release of petroleum from oil shale, underground production of steam for generation of power, and development of large underground reservoirs in arid areas.

PLOWSHARE (1965). 28 minutes, color.

Produced by USAEC's San Francisco Operations Office. For sale by W. A. Palmer Films, at $167.46 per print, including shipping case, F.O.B. San Francisco. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

By using motion pictures and animation to describe the Commission's program for the safe use of nuclear explosives for civilian applications, this film introduces the Plowshare Program, presents the status of its development, and illustrates its ultimate research and development. The film explains the various potential uses of this enormous force of energy to perform tasks for the benefit of mankind, and explores the scope and range of the possible applications of nuclear explosives for mining and petroleum applications, for performing massive earth-moving and excavation projects, and, for utilization in scientific investigations. Safety problems are briefly discussed. The main theme of the film is that the United States, through its Plowshare Program, is offering all nations the potential of harnessing the energy of nuclear explosions for accomplishing peaceful tasks that would otherwise be impossible or impractical.

PROJECT DUGOUT (1964). 8½ minutes, color.

Produced by the USAEC's Lawrence Radiation Laboratory at the University of California. For sale by W. A. Palmer Films, at $53.52 per print, including shipping case, F.O.B. San Francisco. Available for loan (free) from USAEC headquarters, field libraries, and from the Graphic Arts Department, Lawrence Radiation Laboratory, P. O. Box 808, Livermore, Calif. Cleared for television.

This semitechnical film reports on Project Dugout, a chemical high explosive experiment conducted June 24, 1964, at the Nevada Test Site in the Commission's Plowshare Program. The experiment involved the simultaneous detonation of five 20-ton charges of nitromethane emplaced underground in a row. The principal purpose of the experiment was to advance fundamental knowledge of nuclear excavation technology and row cratering effects in a hard rock medium. The film describes the purpose and the objectives of the experiment, previous work with single-charge underground explosions, preparations for the detonation, the detonation, and resulting row crater. The moment of detonation is shown in regular and slow motion and from several vantage points.

PROJECT GNOME (1963). 29 minutes, color.

Produced by the USAEC's Lawrence Radiation Laboratory at the University of California. For sale by W. A. Palmer Films, at $139.83 per print, including shipping case, F.O.B. San Francisco. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

Covers Project Gnome—the first nuclear detonation conducted under the USAEC's Plowshare Program for development of peaceful uses of nuclear explosives—from its planning stage through the early months of the post-detonation period when scientists entered the man-created cavern. Project Gnome was an experiment under the technical direction of the Lawrence Radiation Laboratory involving the detonation on December 10, 1961, of a 3.1-kiloton nuclear explosive in a chamber about 1,200 feet below the earth's surface in the Salado Salt Basin, a thick subsurface salt bed about 25 miles southeast of Carlsbad, New Mexico. Force of the explosion created an underground cavern which today measures about 170 feet across and is almost 90 feet high. Temperatures within the cavity register about 140 degrees. Radiation levels are about five milliroentgens.

Animation is used to explain the scope of Project Gnome and its integrated scientific and technical programs. Project Gnome, one of the most heavily instrumented nuclear detonations ever conducted, was designed to provide scientific and technical information on five objectives: (1) to determine characteristics and physical effects of underground detonations in a salt medium; (2) to explore feasibility of converting energy produced into electricity; (3) to make neutron cross-measurements which would contribute to scientific knowledge;

(4) to provide information on design of nuclear explosives for peaceful purposes; and (5) to investigate the practicability of recovering useful radioisotopes.

Topics covered: geological and safety considerations explored in selection of the Gnome site; drilling and construction of the shaft, underground access tunnel and shot chamber; the surface installations; special monitoring and other programs conducted to afford safety to the public; the seismic and radiological monitoring programs; principal equipment and instrumentation installation in support of the complex scientific experiments; the pre-shot news media tour; the surface movement above ground zero at the moment of detonation; the escape of vapor from the shaft; recovery of scientific data and equipment; and entry into the underground cavity in May 1962. Dr. Edward Teller, University of California nuclear physicist, discusses the objectives of the Plowshare Program and the preliminary results of Project Gnome in the opening and closing scenes.

NOTE: A slightly more technical version of the above film, available upon special request to the USAEC headquarters or San Francisco field libraries is entitled: PROJECT GNOME TECHNICAL REPORT, see below.

PROJECT GNOME TECHNICAL REPORT (1964). 19 minutes, color.
Produced by the USAEC's Lawrence Radiation Laboratory at the University of California. For sale by W. A. Palmer Films, at $79.86 per print, including shipping case, F.O.B. San Francisco. Available for loan (free) only from USAEC headquarters and San Francisco field libraries. Cleared for television.

This film presents the technical aspects of Project Gnome, the first experiment of the U. S. Atomic Energy Commission's Plowshare Program to study peaceful applications of nuclear explosives. Methods of implementation of the basic goals are illustrated by animation. Various measurements—including those of the phenomenology of a nuclear explosion in a dry salt medium, power and isotope production studies, and neutron physics experiments—are discussed. Re-entry into the cavity created by the explosion is shown. Significance of the seismic signals produced, isotope studies, and neutron physics experiments is covered.

NOTE: A slightly less technical motion picture on this subject is available from all USAEC film libraries. For details see PROJECT GNOME, page 29.

PROJECT SEDAN (1962). 8 minutes, color.
Produced by the USAEC's Lawrence Radiation Laboratory at the University of California. For sale by W. A. Palmer Films, at $39.10 per print, including shipping case, F.O.B. San Francisco. Available for loan (free) from USAEC headquarters, field

libraries, and the Graphic Arts Department, Lawrence Radiation Laboratory, P. O. Box 808, Livermore, California. Cleared for television.

This semitechnical motion picture reports on the July 6, 1962 nuclear cratering detonation at the Nevada Test Site. This was the first of a series of experiments under the Atomic Energy Commission's Plowshare Program to determine the feasibility of nuclear excavations. The specific objective was to determine the cratering and radioactivity entrapment effects of detonating a 100-kiloton nuclear device buried 635 feet in desert alluvium. The film discusses the relationships between depth of explosion and crater size, and depth of explosion and containment of radioactivity. It shows the location, slow-motion shots of the detonation, the area covered by the base surge, the crater (1200 feet in diameter, 320 feet in depth), the fallout pattern, and relates the experiment to possible large-scale excavation projects such as harbors and canals.

PHYSICAL RESEARCH

ALPHA, BETA, AND GAMMA (Understanding the Atom Series) . . . . . See page 78

ANALYSIS OF NUCLEON–NUCLEON SCATTERING EXPERIMENTS (1961). 50 minutes, color.

Produced by the USAEC's Lawrence Radiation Laboratory at the University of California. For sale by W. A. Palmer Films, at $276.75 per print, including shipping case, F.O.B. San Francisco. Available for loan (free) only from the USAEC film libraries at Washington, D. C., headquarters, and the Chicago and San Francisco Operations Offices, as well as from the Graphic Arts Department, Lawrence Radiation Laboratory, P. O. Box 808, Livermore, California. Cleared for television.

This filmed lecture by Dr. H. Pierre Noyes is intended primarily for use in a graduate course in, or a seminar on, nuclear physics. It attempts to give an overall picture of the route followed in passing from single-, double-, and triple-scattering experiments to a unique description of the scattering matrix in terms of phase shifts. Although the formal mathematics introduced is kept to a minimum, it presupposes that the student knows what a wave function is, how probability-current is computed from a wave function, and what is meant by a quantum-mechanical state. It is therefore not suitable for use in an undergraduate course or a seminar unless that course has already introduced these concepts to the students. Topics mentioned in the film are as follows: relation between scattering cross section and

scattering amplitude; expression of conservation of angular momentum and of number of particles by writing the scattering amplitude in terms of phase shifts; relation between range of the force and the number of angular-momentum states present; relation between quantum mass and range of force; inclusion of one-pion exchange effects in the phase-shift analysis; the number of independent scattering experiments using two spin-½ particles, illustrated by three-dimensional models for the experiments, P, D, R, A, C_{nn}, and C_{kp}; and problems encountered in trying to determine the best phase-shift solution in terms of least squares. An instructor's manual for use in discussing the subject matter is included in the film case.

THE ATOM IN PHYSICAL SCIENCE (Understanding the Atom Series)
. . . . . See page 78

ATOMIC PHYSICS (1948). 90 minutes, black and white.

Produced by J. Arthur Rank Ltd., England, and released in the U. S. by United World Films. For sale from United World Films at $523.00 per print, including shipping case. Available for loan (free) from USAEC headquarters and field libraries. NOT cleared for television.

This film discusses the history and development of atomic energy, stressing nuclear physics. Dalton's basic atomic theory, Faraday's early experiments in electrolysis, Mendeleev's periodic table, and early concepts and size of atoms and molecules are discussed also. The film demonstrates how cathode rays were investigated and how the electron was discovered; how the nature of positive rays was established; and how X rays were found and put to use. The film also presents research tools of nuclear physics, explains work of Joliot-Curie and Chadwick in discovery of neutron, and splitting of lithium atom by Cockcroft and Walton. Einstein tells how their work illustrates his theory of equivalence of mass and energy. Uranium fission is explained, as well as why it is possible to make an atomic bomb.

BETA RAY SPECTROMETER (1963). 7 minutes, color.

Produced by the USAEC's Argonne National Laboratory. For sale by Byron Motion Pictures, at $22.71 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

By animation and live action, this film explains the principles and working of the Coincidence Beta Ray Spectrometer, a device which is used to measure the intensity and direction of electron emissions known as beta particles. Components of the device are shown and assembled. A source is introduced. Masking for beam direction and size is demonstrated. Detectors are shown and explained.

DISPERSION THEORY APPROACH TO NUCLEON–NUCLEON SCATTERING (1961). 45 minutes, color.

Produced by the USAEC's Lawrence Radiation Laboratory at the University of California. For sale by W. A. Palmer Films, at $277.39 per print, including shipping case, F.O.B. San Francisco. Available for loan (free) only from the USAEC film libraries at Washington, D. C., headquarters, and the Chicago and San Francisco operations offices, as well as from the Graphic Arts Department, Lawrence Radiation Laboratory, P. O. Box 808, Livermore, Calif. 94550. Cleared for television.

This filmed technical lecture by Dr. H. Pierre Noyes, which outlines some of the main ideas and techniques used in the calculation of the nucleon–nucleon scattering matrix from its analytic properties and unitarity, is suitable for use in a seminar at the graduate student-staff level or as an introductory lecture in a course on dispersion theory. It presupposes some familiarity with scattering solutions of the nonrelativistic Schroedinger equation and Cauchy's theorem and an acquaintance with Feynman diagrams, but it does not assume an intimate knowledge of quantum field theory. Topics discussed are as follows: (1) Solution of the S-wave Schroedinger equation for a superposition of exponential or Yukawa potentials by conversion to a Volterra equation, using the method of André Martin. (2) Solution of the same equation by partial-wave-dispersion relations using the N/D method; construction of the potential from the discontinuity in the partial-wave amplitude. (3) The Mandelstam representation for potential scattering and construction of the double-spectral function. (4) Relation between the field–theoretic amplitude and the nonrelativistic scattering amplitude. (5) Relation of nucleon–nucleon scattering to the nucleon–antinucleon amplitude, pion–nucleon scattering, pion–pion scattering, and nucleon electromagnetic structure. The same material is covered in more detail, with references for further study, in a paper presented by the lecturer at the Midwest Conference on Theoretical Physics, held at Minneapolis, in May 1961 (Report UCRL-6402). (This paper is included in the film case as an instructor's manual.)

FABRICATION OF THE ACCELERATOR STRUCTURE (1965). 40 minutes, color.

Produced by the USAEC's Stanford Linear Accelerator Center. For sale by Filmservice Laboratories, Inc., at $124.02 per print, including shipping case, F.O.B. Hollywood. Available for loan (free) only from USAEC headquarters, Washington, D. C., Chicago Operations Office, and San Francisco Operations Office. Cleared for television.

This film describes the methods used in the fabrication of the accelerating structure and associated components for the AEC's two-mile linear electron accelerator at Stanford University. The accelerator

pipe, or disk-loaded waveguide, through which the electron beam travels, is manufactured from oxygen-free, high-conductivity copper cylinders and disks. The film shows in detail the steps followed in brazing together of 84 cylinders and 85 disks to form a basic 10-foot section of the accelerating structure. Significant steps shown and described include: machining of cylinders and disks; annealing of parts; fabrication of input and output coupler sub-assemblies; brazing of a 10-foot section in a unique, hydrogen–oxygen, split-ring burner flame furnace; of tuning and high power of testing of a section using the full power of a klystron tube; and, the mounting of four 10-foot sections and associated components.

FUNDAMENTALS OF RADIOACTIVITY (Radioisotopes Series) . . . . . See page 75

FUSION RESEARCH (A Geneva–1964 film). 22 minutes, color.

Produced by USAEC's Argonne National Laboratory. For sale by Byron Motion Pictures, in English, French, Spanish, or Russian, at $61.93 per print, including shipping case, F.O.B. Washington, D. C. English version available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This technical film describes the nature of thermonuclear research as illustrated by many of the current investigations of plasma production and confinement. The major obstacles to success are plasma oscillations and instabilities which result in plasma loss from the magnetic containers. The film gives a qualitative description of some of the instabilities, of energy loss through charge exchange and radiation due to contaminants; and also describes plasma measurements, which are now very sophisticated. Several research devices in the United States on which progress has been encouraging are described in the film.

HIGH ENERGY PARTICLE ACCELERATORS (1958). 30 minutes, color.

Produced by Audio Productions, New York, for the USAEC. For sale by Byron Motion Pictures, at $114.85 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This technical film surveys the work of particle accelerators in high-energy physics, shows the major accelerator installations in the U. S., major accelerators under construction, and a series of typical experiments with high-energy particles. It explains, with both live action and animation, the components and operations of various types of accelerators and gives a description of bubble chambers. The film features information on the following operating accelerators: the Brookhaven National Laboratory Cosmotron (proton–synchrotron), the Uni-

versity of California Radiation Laboratory Bevatron (largest proton–synchrotron operating in the U.S., as of the fall of 1958), the California Institute of Technology Electron–Synchrotron, the Cornell University Electron–Synchrotron, and Stanford University Linear Accelerator; also, construction work and principles of the Princeton University–University of Pennsylvania Synchrotron (Cosmotron type), Argonne National Laboratory Proton–Synchrotron (up to 12 Bev), Brookhaven Alternating Gradient Synchrotron (25–30 Bev), and the Harvard–MIT Alternating Gradient Electron–Synchrotron (6 Bev). Also included are brief data on studies at Stanford, Oak Ridge, and Midwestern Universities Research Association on the linear, spiral magnet, and fixed-field alternating gradient types, respectively.

HIGH ENERGY PHYSICS RESEARCH (A Geneva–1964 film). 23 minutes, color.

Produced by USAEC's Argonne National Laboratory. For sale by Byron Motion Pictures, in English, French, Spanish, or Russian, at $65.29 per print, including shipping case, F.O.B. Washington, D. C. English version available for loan from USAEC headquarters and field libraries. Cleared for television.

Some 20 very high energy accelerators, scattered throughout the world, are being used to probe the characteristics of subatomic particles. The new particles and their interactions have brought about reconsideration and revision of some of the fundamental laws of physics. This technical film indicates our current understanding of subnuclear particles, nuclear forces, and surveys the status of high energy physics research in the United States. This includes the general types of accelerators and the devices used for particle detection and analysis, the efforts to organize the data into a unified general theory, the difficulty of this problem, and the many remaining questions.

INTRODUCTION TO HIGH VACUUM (1961). 18 minutes, color.

Produced by Brookhaven National Laboratory and Audio Productions for the USAEC and the American Vacuum Society. For sale by Audio Productions, at $72.00 per print, including shipping case, F.O.B. New York. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This technical film (primarily intended for use by engineers, scientists, technicians, students, and personnel of industrial, chemical, and processing plants) defines high vacuum and shows how it is produced and measured. Information is given on the contributions of Torricelli and Von Guericke to vacuum physics; how vacuum is expressed (millimeters of mercury, Torr, particles per cubic centimeter); flow characteristics (viscous and molecular) of gases under vacuum and their influences on vacuum techniques; mechanical and nonmechanical vacuum pumps and their principles of operation (oil-seal rotary, dry-

seal roots, diffusion, and getter-ion types); mechanical and non-mechanical vacuum gauges and their principles of operation (McLeod mercury, thermocouple, and ionization); and typical examples of applications of high-vacuum techniques in product manufacture and in scientific research (freeze-drying process, thin-film-evaporation process, and thermonuclear experiments).

THE MANY FACES OF ARGONNE (1963). 60 minutes, color.

Produced by USAEC's Argonne National Laboratory. For sale by Byron Motion Pictures, at $176.10 per print, including double-shipping-case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters, field libraries, and from Argonne National Laboratory, 9700 South Cass Ave., Argonne, Ill. 60440. Cleared for television.

Although the film is about Argonne National Laboratory, it will be useful to both technical and nontechnical audiences who wish an interesting survey of the objectives, methods, and hardware of the broad range of nuclear research conducted by a typical national laboratory of the USAEC.

With both artistry and clarity, the ANL narrator shows us CP-5 and the range of work accomplished with this powerful research reactor. In an ANL chemistry laboratory, we see investigation of atomic forces with "color center" studies of the structure of crystals. Information is given on methods of protecting atomic scientists from radiation: film badges and dosimeters; the checking of air, water, walls, dust; and the remote-control devices involving periscopes and television in order to see and work despite massive shielding.

Argonne's efforts in the power reactor field are summarized, using the Experimental Breeder Reactor-II as an example, with detailed explanation of its components, purposes, methods, etc.

Experiments to learn the effects of radiation on human beings are explained—studies of the effects of radiation received continually over a lifetime (bone-tumor studies); studies of the mutation-producing effects of radiation (fruitfly studies, work with dogs, etc.); studies of neonatal death rates; life-span studies; studies of leukemia; effects of radiation on cells, etc.

The film shows in detail the giant Zero Gradient Synchrotron accelerator—or "atom-smasher"—used to tear apart subatomic particles to study the basic nature of matter. Argonne's relationship to American universities is outlined with views of the training of foreign students.

NEUTRON ACTIVATION (A Geneva—1964 film). 8 minutes, color.

Produced by USAEC's Argonne National Laboratory from film footage made by General Atomic, Division of General Dynamics. For sale by Byron Motion Pictures, in English, French, Spanish,

or Russian, at $26.06 per print, including shipping case, F.O.B. Washington, D. C. English version available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

When a substance is irradiated with neutrons, minute quantities of radioactive elements are produced. By measuring the quantity and energy spectrum of the radiation produced, we can obtain an extremely sensitive and precise measurement of the elements present. This technical film describes the general techniques, applications, and sensitivities of this powerful analytical tool.

NEUTRON ACTIVATION ANALYSIS (1964). 40 minutes, color.

Produced for the USAEC by the General Atomic Division, General Dynamics. For sale by McNamara Productions, at $121.22 per print, including shipping case, F.O.B. Los Angeles. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This technical film deals with the nature, potentialities, and applications of neutron activation analysis—a highly sensitive and powerful analytical technique that has grown out of the study of peaceful uses of nuclear energy. It is a method of analyzing samples for various elements by bombarding them with neutrons to make some of the elements radioactive, and then identifying and measuring the induced radioactivities to complete the quantitative analysis. The film shows the kinds of neutron sources used (isotopic, accelerator, and nuclear reactor), the latest counting techniques employed (especially those of multichannel gamma-ray spectrometry and spectrum stripping), and illustrates the wide applicability of the method to many kinds of problems, samples, and studies.

Both activations with thermal neutrons and with fast neutrons are shown. The purely instrumental, nondestructive form of the method and also the form involving radiochemical separations with carriers are illustrated. The microgram-to-milligram sensitivities attainable with low-cost accelerator neutron sources and the sub-nanogram to microgram sensitivities achieved with a modern pool-type research reactor are reviewed. The high speed of the instrumental method is stressed, and the possibilities of automation and computer calculation are presented. Interesting examples of recent applications of the method in the fields of scientific crime detection, geology and geochemistry, agriculture, medicine, the petroleum and chemical industries, and the semiconductor industry are shown.

NEUTRON DIFFRACTION (A Geneva–1964 film). 9 minutes, color.

Produced by Argonne National Laboratory. For sale by Byron Motion Pictures in English, French, Spanish, or Russian, at $28.18 per print, including shipping case, F.O.B. Washington,

D. C. English version available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

The wavelengths of thermal neutrons are comparable to X rays used in the study of crystal structures and produce similar diffraction effects. Since the scattering processes are different, neutron diffraction studies provide information which cannot be obtained by other methods. They are particularly useful for determining the positions of light atoms in the crystal structure and provide a unique technique for the study of magnetic orientation. This technical film describes the principles of neutron diffraction and indicates new fields of investigation which previously were considered not feasible.

NEUTRON IMAGE DETECTOR (1965). 5½ minutes, color.

Produced by the USAEC's Argonne National Laboratory. For sale by Color Service Co., at $12.76 per print, including shipping case, F.O.B. New York City. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

In a number of areas of nuclear research it is necessary to detect and visualize the distribution of neutrons. Like X rays, the penetrating characteristics of neutrons can be used for radiography. However, the absorption characteristics of neutrons and X rays are quite different and this makes neutron radiography a very valuable technique. The film describes a new vacuum tube developed by the Argonne National Laboratory Metallurgy Division and the Rauland Corporation, a subsidiary of Zenith Radio Corporation. The tube contains a neutron-sensitive screen one foot in diameter. It produces a brilliant image which may be viewed with a closed circuit television camera. Applications of the tube to neutron radiography and neutron motion pictures are illustrated.

THE NUCLEAR WITNESS—ACTIVATION ANALYSIS IN CRIME INVESTIGATION . . . . . See page 26

PRACTICAL PROCEDURES OF MEASUREMENT (Radioisotopes Series) . . . . . See page 76

PROPERTIES OF RADIATION (Radioisotopes Series). . See page 76

PROPERTIES OF RADIATION (Understanding the Atom Series) . . . . . See page 79

RADIATION AND MATTER (Understanding the Atom Series) . . . . . See page 80

RADIATION DETECTION BY IONIZATION (Understanding the Atom Series) . . . . . See page 80

RADIATION DETECTION BY SCINTILLATION (Understanding the Atom Series) . . . . . See page 80

RADIATION EFFECTS IN CHEMISTRY (A Geneva–1964 film). 13 minutes, color.

Produced by USAEC's Argonne National Laboratory. For sale by Byron Motion Pictures, in English, French, Spanish, or Russian, at $39.60 per print, including shipping case, F.O.B. Washington, D. C. English version available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This technical film explains that radiation initiates a wide variety of chemical reactions. But the fundamental mechanisms which produce these effects are still under investigation. Within a few nanoseconds after irradiation, a variety of chemical substances are produced which are then available to participate in subsequent reactions. The experimental study of this process requires extremely sensitive and high-speed techniques—spectrometry, electron spin resonance techniques, etc.

THE RADIOISOTOPE: METHODOLOGY (Radioisotopes Series) . . . . . See page 77

RESEARCH INTO CONTROLLED FUSION (1958). 55 minutes, color.

Produced by the U. S. Army Pictorial Center for the USAEC. For sale by Byron Motion Pictures, at $163.09 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This film is a technical progress report of the fusion research programs sponsored by the U. S. Atomic Energy Commission at Princeton University, Oak Ridge National Laboratory, Los Alamos Scientific Laboratory, and the University of California Radiation Laboratory. An outline is given of the principal problems in controlled fusion, and the film then switches to the laboratories, where the research devices are shown and described in detail by means of animation. Devices described are the various pinch, mirror, rotating plasma, DCX, and Stellarator machines. (This film requires only a rudimentary knowledge of physics to be understood, but it should be most useful at college colloquia as a summary of present research in hot plasma physics.)

TRANSCURIUM ELEMENTS: SYNTHESIS, SEPARATION AND RESEARCH (1965). 31 minutes, color.

Produced by the USAEC's Lawrence Radiation Laboratory at the University of California. For sale by W. A. Palmer Films, at $132.27 per print, including shipping case, F.O.B. San Fran-

cisco. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This technical film describes three basic transcurium research experiments at the USAEC's Lawrence Radiation Laboratory in Livermore by University of California scientists. Transcurium element research is part of a continuing program at the laboratory designed to further the knowledge of the chemical nature and nuclear structure of the recently discovered heavy elements, berkelium, californium, einsteinium and fermium.

The specialized separation work in research was performed at the laboratory after the elements were synthesized in the Materials Testing Reactor at the USAEC's National Reactor Testing Station in Idaho. The film shows the capsule containing a one-gram mixture of plutonium-242, americium-243, and curium-244 being released from the reactor after four years of irradiation in the highest neutron flux region of the core. This exceptionally long irradiation was required to produce millionths of a gram of the transcurium elements. The process of transmuting one element to the next heavier by neutron capture is illustrated in the film.

The chemical separation techniques and equipment are explained during operational tests. Photography through the observation window depicts some of the significant steps in the chemical separation. A dramatic part of the separation occurs when the curium can be seen separating from other elements by its luminescence or light generated by radioactivity.

The first research experiment illustrates the discovery of a new isotope of fermium of mass 257. This isotope proved to have a much longer half-life than predicted from existing theory. This is the first strong evidence that the search for new elements may not be limited by short half-lives.

The next experiment shows the measurement of the neutron induced fission of einsteinium-253. These measurements furnished additional data for calculating the yield of products formed in neutron irradiations.

The final experiment explains how 70 per cent of the world's supply of purified berkelium was formed into a crystal to concentrate its self-luminescent light. Animation effectively illustrates how the slightly different wave lengths of light, emitted from berkelium, enabled scientists to determine the configuration and energy of the electrons in its outer orbit.

The film covers the various steps performed in each experiment and shows the equipment required to perform the intricate scientific analyses. Other studies and long range objectives of the program are discussed.

XENON TETRAFLUORIDE (1962). 5½ minutes, color.

Produced by USAEC's Argonne National Laboratory. For sale from the Calvin Company, at $16.86 per print, including shipping case, F.O.B. Kansas City. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This technical film shows how chemists at Argonne National Laboratory have succeeded in making xenon combine chemically with fluorine—the first combination of xenon and one other element, a chemical reaction previously thought to be impossible—which has opened up a new area for the study of chemical bonding. The film shows the preparation of the compound in the laboratory under special conditions of temperature and pressure. The ingredients are sealed in a glass vacuum tube and first heated to 400°C for one hour, then cooled rapidly to room temperature. Crystals of xenon tetrafluoride—the new compound—grow before your eyes. Tests to substantiate the exact nature of the compound are illustrated, and future experiments on forming compounds with rare gases are discussed.

POWER REACTORS

ATOMIC POWER AT SHIPPINGPORT (1958). 30 minutes, color.

Produced by Audio Productions, New York, for the Westinghouse Electric Corp. For sale by Consolidated Film Industries, at $94.51 per print, including shipping case, F.O.B. Los Angeles. Available for loan (free) from USAEC headquarters and field libraries. NOT cleared for television.

This film describes the first full-scale nuclear power plant designed exclusively for generation of electricity for civilian use. Located at Shippingport, Pa., this power plant (of the pressurized water type) is unique because of its developmental nature. Its primary objective is to advance reactor technology and to obtain information on nuclear power plants that would be readily operable in a conventional electric utility network. The film shows design problems and how they were solved, construction and operation details, methods of cycling the light water coolant, fabrication, and characteristics and placement of fuel elements.

ATOMIC VENTURE (1961). 23½ minutes, color.

Produced by, and for sale by, the General Electric Company. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This semitechnical film, which is a sequel to the 1958 film entitled "Dresden Nuclear Power Station" (in this catalog), covers the design and development of a large dual-cycle boiling-water reactor—the 180,000-kw Dresden Nuclear Power Station—built by General Electric Company (GE) for the Commonwealth Edison Company, Chicago, and the Nuclear Power Group, Inc., and the history of the project from its

beginning in 1955 to its completion in 1959. The film shows major stages of development, including clearance of the site 47 miles southwest of Chicago; groundbreaking: construction of foundations, sphere, and other buildings; manufacture of the containment vessel and fuel; shipment and arrival of major components; installation of the reactor core, reactor vessel, and turbine-generator; testing of completed installations; and the station's "going critical." The film also includes scenes relating to development work for Dresden carried out at GE's Vallecitos Atomic Laboratory near Pleasanton, Calif.

ATOMIC WEATHERMAN: STRONTIUM-90 ISOTOPIC APPLICATIONS (1961). $18\frac{1}{2}$ minutes, color.

Produced for the USAEC by the Martin Marietta Corporation. For sale by Capital Film Laboratories, at $103.90 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This semitechnical film describes the world's first radioisotope-powered weather station, which is operating unattended at a remote site in the Canadian Arctic. The "atomic" weather station is powered by a thermoelectric unit in which the heat from the decay of ^{90}Sr is directly converted into electricity. The film shows the major steps in the identification, testing, and preparation of the ^{90}Sr titanite compound; the loading of the radioisotope source in the weather-station generator; the principle of direct conversion of heat into electricity; the operation of the generator; the weather-station equipment for sensing, data processing, and control and transmission; the final testing; the 4000-mile journey north into the remote Canadian Arctic aboard an icebreaker; the weather-station installation; and the successful transmission of weather data. The film explains the principal methods of handling radioactive wastes from nuclear-reactor operations; the techniques for recovering valuable radioisotopes, such as ^{90}Sr; and the development of ^{90}Sr thermoelectric sources for unique small-scale power applications. Brief information is also given on other applications of ^{90}Sr thermoelectric devices.

BORAX: CONSTRUCTION AND OPERATION OF A BOILING WATER REACTOR (1955). 14 minutes, black and white.

Produced by the USAF's Lookout Mountain Air Force Station for Argonne National Laboratory and the USAEC. For sale by Lookout Mountain Air Force Station, at $18.00 per print, including shipping case. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This picture may be considered a sequel to "Safety Experiments with a Boiling Reactor" (in this catalog). Based on the safety experiments, Argonne scientists proceeded to the next step: putting a generating

system onto a boiling-water type reactor. Electricity produced from "Borax" was used for an hour on July 17, 1955, to light and power Arco, Idaho, the first U. S. community to be lighted exclusively on a city-wide basis by nuclear power. The picture shows the construction and operation of the reactor power plant and the lighting of Arco.

CONSTRUCTION OF THE EXPERIMENTAL BOILING WATER REACTOR (1957). 10 minutes, black and white.

Produced by USAEC's Argonne National Laboratory. For sale by Byron Motion Pictures, at $12.10 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters, field libraries, and Argonne National Lab., 9700 South Cass Ave., Argonne, Ill. Cleared for television.

The Experimental Boiling Water Reactor (EBWR), an experimental nuclear power plant of 5000-kw electrical capacity, was the first of the reactors in the USAEC's nuclear power development program to be completed. This semitechnical documentary film describes highlights of construction of the EBWR buildings, particularly the containment shell for the power plant. The erection of the steel shell, special concrete work, and installation of equipment, including the reactor pressure vessel, are shown. The requirements for various structural components are described.

DEVELOPING HOMOGENEOUS REACTORS (1955). 23 minutes, black and white.

Produced by USAEC's Oak Ridge National Laboratory. For sale from Byron Motion Pictures, at $25.92 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters, field libraries, and Oak Ridge National Laboratory, Oak Ridge, Tenn. Cleared for television.

This film depicts some of the most important stages in the development, construction, operation, and dismantling of Homogeneous Reactor Experiment No. 1 (HRE-1), which was designed to operate at 1000 kw. Testing of the most important reactor features is shown, along with the most important steps in assembling the reactor. Operation of the reactor is pictured. The film closes with scenes of the reactor being disassembled to make room for HRE-2.

DRESDEN NUCLEAR POWER STATION (1958). 15 minutes, color.

Produced by the Atomic Power Equipment Department, General Electric Company, San Jose, Calif. For sale by Byron Motion Pictures, at $50.13 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This film shows construction of the 180,000-kw Dresden Nuclear

Power Station at a site near Chicago, Ill. The film includes views of the fabrication of the 350-ton reactor pressure vessel at New York Shipbuilding Corporation and of other components at the General Electric Atomic Power Equipment Department headquarters at San Jose, Calif. Aerial views and closeups of the construction of the 190-ft-diameter containment sphere for the reactor are also shown.

THE EXPERIMENTAL BOILING WATER REACTOR (1958). 30 minutes, color.

Produced by USAEC's Argonne National Laboratory. For sale by Byron Motion Pictures, at $93.69 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters, field libraries, and Argonne National Lab., 9700 South Cass Ave., Argonne, Ill. 60440. Cleared for television.

This semitechnical documentary film presents an actual account of the construction and operation of the reactor. It begins with the installation of the reactor components, with pressure vessel and other units in the steam cycle already in place. This continues through the assembly of reactor components, 20-Mw operation, then the generation of 5000 kw of electricity. The standard operational procedures of the plant, including startup procedure, are included. Also shown are significant engineering tests through 3060-Mwd operation and subsequent inspection of turbine and reactor.

EXPERIMENTAL BREEDER REACTOR I, MARK III (1958). 13½ minutes, color.

Produced by USAEC's Argonne National Laboratory. For sale by Byron Motion Pictures, at $51.81 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters, field libraries, and Argonne National Lab., 9700 South Cass Ave., Argonne, Ill. Cleared for television.

This film presents some major aspects of the fabrication, installation, and operation of a new core (Mark III) for the Experimental Breeder Reactor I at the National Reactor Testing Station, Idaho.

FAST REACTOR DEVELOPMENT (A Geneva–1964 film). 17 minutes, color.

Produced by USAEC's Argonne National Laboratory. For sale by Byron Motion Pictures, in English, French, Spanish, or Russian, at $41.57 per print, including shipping case, F.O.B. Washington, D. C. English version available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This technical film reports on sodium-cooled fast breeder reactors: the Experimental Breeder Reactor II and the Enrico Fermi Atomic Power Plant. Along with the design features of both facilities, the film

tells about the experiences with fuel handling, sodium components, and reactor operation. A brief history includes EBR-I and the potential of fast breeder reactors in the nuclear power economy.

FAST REACTOR PROGRAM (1958). 36 minutes, color.

Produced by USAEC's Argonne National Laboratory. For sale by Byron Motion Pictures, at $117.68 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters, field libraries, and Argonne National Lab., 9700 South Cass Ave., Argonne, Ill. Cleared for television.

This technical film is an abstract of some major features of the fast reactor program in the areas of reactor performance, safety and reliability, system components, and fuel-cycle developments.

GAS COOLED REACTOR EXPERIMENT (1960). 39 minutes, color.

Produced through USAEC's Idaho Operations Office by Lookout Mountain Air Force Station for the USAEC and the U. S. Army Corps of Engineers. For sale by Lookout Mountain Air Force Station, at $132.96 per print, including shipping case. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This film describes the design, development, component fabrication, assembly, testing, and initial criticality of the first direct- and closed-cycle gas-cooled reactor—the GCRE-I—pointing toward the development of the first U. S. mobile nuclear power plant. This film, among the first to stress the engineering aspects of developing a new reactor concept, tells its story through a series of interviews on the site with some of the industrial and government personnel responsible for the GCRE-I from initial concept to completion.

HALLAM NUCLEAR POWER FACILITY (1963). 20 minutes, color.

Produced by USAEC's Chicago Operations Office. For sale by the Calvin Productions, at $63.36 per print, including shipping case, F.O.B. Kansas City. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This film shows the setting and location of the reactor built jointly by USAEC and the Consumers' Public Power District of Nebraska. An explanation of this type of reactor, using a liquid metal coolant, is given stressing its advantages. The working of the plant is shown in animation. Live footage shows construction of the reactor containment vessel, its transportation from Philadelphia to Hallam, moderator fabrication and installation, installation and operation of safety rods, use of an intermediate heat exchanger, installation of steam piping, and the installation of the turbine and generator. Also shown are fuel handling, cleaning and storage cells, fuel fabrication, and testing.

HOMOGENEOUS REACTOR EXPERIMENT-II (1958). 19 minutes, color.

Produced by USAEC's Oak Ridge National Laboratory. For sale by Byron Motion Pictures, at $60.84 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters, field libraries, and Oak Ridge National Laboratory, Oak Ridge, Tenn. Cleared for television.

This film summarizes the components, facilities, and operations of Homogeneous Reactor Experiment No. II, an aqueous, homogeneous, forced-circulation, experimental power reactor operating with a dilute solution of uranyl sulfate in heavy water as fuel, and with a heavy-water reflector. Designed output of the core is at a heat range of 5000 kw.

THE HWCTR AND THE HEAVY WATER POWER REACTOR PROGRAM (1962). 31½ minutes, color.

Produced by the USAEC's Savannah River Operations Office, John L. Feierbacher, consultant. For sale by Byron Motion Pictures, at $87.03 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This film depicts the growing need for nuclear power and describes the features of heavy water reactors for use in power production. The development program conducted by the Atomic Energy Commission on this reactor concept is described in detail. Design studies performed on promising heavy water reactor concepts established the technical feasibility and economic promise of this concept. A number of research tasks in the fields of fuel design, engineering of low leakage components, studies of heat transfer and the physics of natural uranium heavy water systems were investigated in detail by Dupont and other research contractors to the USAEC. The facilities at the Savannah River Laboratory and at commercial laboratories used in this program are shown.

Primary emphasis in the development program was placed on design of an inexpensive natural uranium fuel element for the heavy water reactor. Processes of fuel fabrication of both uranium metal and uranium oxide are described. To verify the results of the fuel development and other engineering programs a test reactor called a Heavy Water Components Test Reactor (HWCTR) was constructed at the Savannah River Plant. The film describes the construction of this reactor and outlines in detail the technical features and capabilities of the HWCTR and its special loop systems in demonstrating the heavy water reactor concept.

IN-PILE LOOP TESTS OF HOMOGENEOUS REACTOR MATERIALS (1958). 25 minutes, color.

Produced by USAEC's Oak Ridge National Laboratory. For sale by Byron Motion Pictures, at $80.94 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters, field libraries, and Oak Ridge National Laboratory, Oak Ridge, Tenn. Cleared for television.

This technical film describes a typical in-pile loop experiment in the radiation-corrosion program of the Homogeneous Reactor Project at the USAEC's Oak Ridge National Laboratory. Particular emphasis is given to the equipment and experimental procedures used in evaluating effects of nuclear radiation on corrosion of metals and alloys exposed to an approximation of the environment in a circulating-fuel aqueous homogeneous reactor.

THE MANY FACES OF ARGONNE . . . . . See page 36

ML-1 MOBILE NUCLEAR POWER PLANT (1963). 26 minutes, color.

Produced for the U. S. Army and USAEC (under the technical direction of the Idaho Operations Office, USAEC) by the Lookout Mountain Air Force Station. For sale by Lookout Mountain Air Force Station, at $99.15 per single print, including shipping case, F.O.B. Hollywood. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This semitechnical film states the army's logistical need for mobile power, and then shows how that need is partially filled by the design, construction, testing, and field operation of a new transportable power reactor plant, the ML-1. An explanation of the design of this gas-cooled, water-moderated reactor is given. Development of the reactor at the USAEC's National Reactor Testing Station, Idaho, is shown. The design and testing of the turbomachinery takes place at the Army Engineer Research and Development Laboratory, Ft. Belvoir, Virginia. The film also covers the training of the operating crews, assembly of the ML-1, checkout and test run, testing of the transportability of the system using mock-ups, simulated transportation of the ML-1 to the field, and its start-up and criticality.

NUCLEAR ENERGY GOES RURAL (1963). 14½ minutes, color.

Produced by USAEC's Chicago Operations Office. For sale by Anthony Lane Studios, at $57.00 per print, including shipping case, F.O.B. Minneapolis. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This film presents the background, planning, and construction of the Elk River Reactor for Minnesota's Rural Cooperative Power Association. After the rural background and setting are established, the planning of the reactor is shown. Animation is used to explain the principle of the boiling water reactor with conventional superheated steam. A comparison is made with the hot air heating system used in

the home, and the reactor's control rods are compared with a thermostat. The reactor control room is shown. A "Scram" is explained. Fuel operations are also explained, as well as the air monitoring system.

THE NUCLEAR SHIP *SAVANNAH* (A Geneva–1964 film). 10 minutes, color.

Produced by Babcock & Wilcox Co. For sale by Byron Motion Pictures, in English, French, Spanish, or Russian, at $30.52 per print, including shipping case, F.O.B. Washington, D. C. English version available for loan from USAEC headquarters and field libraries. Cleared for television.

This technical film is an account of the experience with the design, construction, and operation of the nuclear power plant for the NS *Savannah,* the world's first nuclear-powered cargo-passenger ship. The film describes and explains the results of the pre-critical system tests and operational performance during the extended sea trials. Included are scenes of critical experiments, fuel loading, sea trials, major safety tests at the USAEC's Idaho National Reactor Testing Station, and visits to some of the major U. S. ports.

OMRE FUEL ELEMENT REMOVAL AND SECOND CORE LOADING (1959). 15 minutes, color.

Produced by Atomics International for the USAEC. For sale by Capital Film Laboratories, at $50.67 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries and Atomics International, P. O. Box 309, Canoga Park, Calif. 91305. Cleared for television.

This film reports on operations of the Organic Moderated Reactor Experiment, an experimental nuclear power project conducted by Atomics International for the USAEC at the National Reactor Testing Station, Idaho. A summary of operating experience and test programs from reactor start-up in September 1957 to July 1959 is presented. The simplicity of operating the reactor is highlighted. Removal of the first reactor core and loading of the second core are detailed.

OPERATING EXPERIENCE–DRESDEN (A Geneva–1964 film). 10 minutes, color.

Produced by the General Electric Company. For sale by Byron Motion Pictures, in English, French, Spanish, or Russian, at $28.91 per print, including shipping case, F.O.B. Washington, D. C. English version available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This technical film reports on the routine, day-to-day operation of the Dresden Nuclear Power Station and points up the success of the

boiling water nuclear-electric power station. Dresden's four years of operating experience are reviewed, and the power station is examined in terms of dependability, safety, ease of operation, and ease of maintenance.

OPERATING EXPERIENCE–HALLAM (A Geneva–1964 film). 10 minutes, color.

Produced by Atomics International. For sale by Byron Motion Pictures, in English, French, Spanish, or Russian, at $22.49 per print, including shipping case, F.O.B. Washington, D. C. English version for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This technical film depicts the operation of the 79-megawatt electric Hallam Nuclear Power Station, the U. S. first central station generating plant powered by a sodium-graphite reactor (252 megawatt). The film demonstrates Hallam's heat transfer cycle and plant operation features, including fuel transfer and sodium handling. This nuclear plant, designed for USAEC by Atomics International, is operated by Consumers Public Power for the USAEC.

OPERATING EXPERIENCE–INDIAN POINT (A Geneva–1964 film). 10 minutes, color.

Produced by the Babcock & Wilcox Company. For sale by Byron Motion Pictures, in English, French, Spanish, or Russian, at $26.28 per print, including shipping case, F.O.B. Washington, D. C. English version available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This technical film is the story of the design, construction, and operation of the Indian Point power station of the Consolidated Edison Co. of New York, one of the first nuclear power stations in the U. S. serving a large metropolitan area. The film describes and explains some of the theoretical concepts and operating characteristics of the world's first station using thorium as the fertile material, and including critical core experiments, core design and models, and on-location operational plant scenes.

OPERATING EXPERIENCE–YANKEE (A Geneva–1964 film). 10 minutes, color.

Produced by Westinghouse Electric Corporation. For sale by Byron Motion Pictures, in English, French, Spanish, or Russian, at $32.56 per print, including shipping case, F.O.B. Washington, D. C. English version available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This technical film relates various plant design features and performance data of the nuclear power station operated by the Yankee Atomic Electric Company. The plant has been in service more than

3 years. Initially rated at 134 Mw(e), current output with its third core is 185 Mw(e).

ORGANIC MODERATED REACTOR EXPERIMENT (1958). 16 minutes, color.

Produced by Atomics International for the USAEC. For sale by Byron Motion Pictures, at $58.05 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries, and from Atomics International, P. O. Box 309, Canoga Park, Calif. Cleared for television.

This film presents a pictorial summary of the fabrication and operation of the OMRE facility at the USAEC's National Reactor Testing Station, Idaho, being conducted by Atomics International to investigate the use of organic materials as a reactor coolant, for transferring heat and for moderating neutrons. The film also depicts the technique of melting the organic moderator and methods of monitoring.

THE PIQUA NUCLEAR POWER FACILITY (1963). 23 minutes, color.

Produced by the USAEC's Chicago Operations Office. For sale by Byron Motion Pictures, at $64.18 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

The Piqua Nuclear Power Facility is the first municipally owned power plant using steam produced by a USAEC nuclear reactor. This film gives an animated explanation of Piqua's reactor—an organic moderated reactor—and compares it with the liquid metal sodium graphite type reactor at Hallam, Nebraska, and the pressurized water reactor at Shippingport, Pa. Live action footage of the Organic Moderated Reactor Experiment at the National Reactor Testing Station in Idaho is shown, as well as of the design and construction of the Piqua facility.

PLUTONIUM RECYCLE . . . . . See page 23

PM-1 NUCLEAR POWER PLANT (1962). 20 minutes, color.

Produced by the Nuclear Division, Martin Company, for the USAEC. For sale by Calvin Productions, at $55.28 per print, including shipping case, F.O.B. Kansas City. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

A filmed story of the PM-1 nuclear power plant (a pressurized water system), a joint project of the USAEC and the USAF, which supplies the power for the radar and space heating of a remote Air Defense Command radar station in Wyoming. The film breaks down the types and contents of 16 air-transportable packages, a total weight of about

30,000 pounds: reactor, steam generator, waste tank, heat-transfer apparatus, control room, turbo-generator, etc.

Details are given on major components and the design and operation of the system by information on: 741 nuclear fuel tubes in 7 fuel bundles, the "flow" of primary water, the secondary water, details on the makeup of the fuel element tubes, criticality testing, nature of the control rods, and tests to determine heat transfer and flow characteristics. The film recounts the airlift of the packages, erection and assembly of the power plant, the work to achieve criticality, and the varied safety controls.

PM-3A NUCLEAR POWER PLANT—ANTARCTICA (1963). 20 minutes, color.

Produced by the Martin Company for the USAEC. For sale by Byron Motion Pictures, at $64.11 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This is the semitechnical film-story of the 1,500-kilowatt nuclear power station built, under contract to USAEC, for operation by the Navy at McMurdo Station, Antarctic headquarters for the joint Navy-National Science Foundation Antarctic Research Project. PM-3A, the first atomic power station in the bleak Antarctic, supplies electric power and space heating for the isolated station. Use of nuclear power reduces the massive amounts of fuel oil for generating electricity that must be brought 11,000 miles by American tankers. PM-3A was designed, fabricated, and tested in 14 months. Details are given on the plant's pressure vessel, coolant, nuclear fuel, control rods, switchgear, heat-transfer equipment, turbo-generator, and many other major components. We see shots of the erection and testing of the reactor in the States, site preparation by Seabees in the Antarctic, erection and testing of the reactor at McMurdo, safety aspects, and achievement of criticality.

POWER REACTOR EXPERIENCE IN THE UNITED STATES (A Geneva—1964 film). 30 minutes, color.

Produced by USAEC's Argonne National Laboratory. For sale by Byron Motion Pictures, in English, French, Spanish, or Russian, at $80.24 per print, including shipping case, F.O.B. Washington, D. C. English version available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This technical film surveys the current status of power reactor development in the U. S., with particular emphasis placed on the economic aspects and the development of a privately owned nuclear power industry. The film shows how economic factors are related to fuel burnup, power levels, containment and similar design limits, and

how these limits have increased steadily so that light water reactors are competing successfully with fossil-fueled plants in many areas of the country. Breeder reactors are discussed, as well as thorium and plutonium recycle techniques. Also described are major efforts in the development of chemical and spectral shift reactor controls.

POWER REACTORS — USA (1958). 55 minutes, color.

Produced for the USAEC by the Los Angeles Division, Lytle Corp. Prints for sale (made from a master) from Byron Motion Pictures, at $176.86 per print, including shipping case, F.O.B. Washington, D. C. Prints for sale (made from the original) from Lookout Mountain Air Force Station, at about $275.00 per print. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This semitechnical film pictures the entire panorama of the U. S. power reactor program with live action and animation. Major developments are shown in the technology of the pressurized-water, boiling-water, homogeneous, organic-moderated, sodium-graphite, and fast-breeder concepts by illustrating with shots of the technical status of the following reactors: Shippingport, Army Package Power, Indian Point, Yankee, Experimental Boiling Water, Vallecitos, Dresden, Organic Moderated Reactor Experiment, Sodium Reactor Experiment, Experimental Breeder Reactor No. 1, Enrico Fermi, and Homogeneous Reactor Experiments No. 1 and No. 2.

REMOTE MAINTENANCE OF MOLTEN SALT REACTORS (1960). 20 minutes, color.

Produced by USAEC's Oak Ridge National Laboratory. For sale by the Calvin Productions, at $84.22 per print, including shipping case, F.O.B. Kansas City, Mo. Available for loan (free) from USAEC headquarters and the Oak Ridge Operations Office, USAEC, P. O. Box E, Oak Ridge, Tenn. 37830. Cleared for television.

This film illustrates (1) the arrangement of a mock-up fluid-fuel reactor system approximately 20 Mw(t) in size and (2) the remote operation of specialized equipment utilized to maintain reactor components. Various components, such as the core vessel, pump and motor, heat exchanger, and preheaters, are removed and replaced under conditions simulating experience with a molten-salt reactor.

REMOTE REPAIR AND MODIFICATION OF THE HRE-2 CORE VESSEL (1961). 20 minutes, color.

Produced by USAEC's Oak Ridge National Laboratory. For sale by the Calvin Productions, at $59.44 per print, including shipping case, F.O.B. Kansas City, Mo. Available for loan (free)

from USAEC headquarters and field libraries. Cleared for television.

This technical film illustrates the remote repair and modification of the Homogeneous Reactor Experiment No. 2 (HRE-2) core vessel following the formation of two holes that permitted the transfer of fuel to the blanket side of the reactor. The film shows special equipment that had to be designed for repairing the HRE-2 and the problems involved in working with the reactor, where the radiation level in the vessel was greater than 100,000 r/hr. All the work had to be performed through the blanket access, which is $3\frac{1}{2}$ in. in diameter, and the core access, which is $2\frac{1}{8}$ in. in diameter.

RESTORATION OF THE NRX REACTOR . . . . . See page 59

SAFETY EXPERIMENTS WITH A BOILING REACTOR . . . . . See page 68

THE SL-1 ACCIDENT, PHASES 1 AND 2 . . . . . See page 69

THE SL-1 ACCIDENT, PHASE 3 . . . . . See page 70

SODIUM GRAPHITE REACTOR PROGRESS REPORT (1955). 17 minutes, color.

Produced by Atomics International for the USAEC. For sale from Byron Motion Pictures, at $57.18 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries or Atomics International, P. O. Box 309, Canoga Park, Calif. Cleared for television.

This film depicts a number of experiments devoted to development of the Sodium Graphite Reactor, with special emphasis on development of the fuel element. A number of sequences of the testing of components are shown.

SODIUM REACTOR EXPERIMENT (1958). 22 minutes, color.

Produced by Atomics International for the USAEC. For sale by Byron Motion Pictures, at $90.12 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries and Atomics International, P. O. Box 309, Canoga Park, Calif. Cleared for television.

This film presents a summary of the preparation, fabrication, and testing of major reactor components, installation at the site, the start-up, operation of the reactor, and control and safety elements of the Sodium Reactor Experiment (nuclear power)—designed, constructed, and operated for the USAEC by Atomics International near Los Angeles.

SODIUM REACTOR EXPERIMENT FABRICATION (1957). 19 minutes, color.

Produced by Atomics International for the USAEC. For sale from Byron Motion Pictures, at $62.03 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries or Atomics International, P. O. Box 309, Canoga Park, Calif. Cleared for television.

The fabrication and testing of major reactor components for the Sodium Reactor Experiment (SRE) are shown in this technical film. (The SRE incorporates a 20,000-kw(t) reactor having the basic design features of a central-station sodium graphite reactor. The goals of this program are to study and improve technology associated with the sodium graphite type of nuclear reactors and to demonstrate the technical feasibility of this approach to economical nuclear power.) A brief animated section shows some of the engineering features and describes the basic layout of the reactor and associated facilities. Detailed information is presented on fuel-element fabrication and testing, grid-plate fabrication, control-rod system testing, core-tank fabrication, thermal-shield-ring fabrication, top plug fabrication, sodium pump inspection, heat-exchanger and coolant-piping inspection, and fuel-handling system checkout.

SRE CORE RECOVERY FOLLOWING FUEL-ELEMENT DAMAGE . . . . . See page 72

VALLECITOS BOILING WATER REACTOR (1958). 8 minutes, color.

Produced by Atomic Power Equipment Department, General Electric Company, San Jose, California. For sale from Byron Motion Pictures, at $25.36 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This film shows operation of the General Electric Vallecitos Boiling Water Reactor and the Pacific Gas & Electric Company's turbine-generator installation. Also included are views of the loading of the reactor, interior of the reactor containment vessel, and the turbine-generator installation. Reactor startup procedures and actual operating sequences are shown, including closeups of control and instrumentation.

RESEARCH AND TEST REACTORS

ADVANCED TEST REACTOR (A Geneva–1964 film). 9 minutes, color.

Produced by Ebasco Services, Inc., Babcock & Wilcox Co., and Phillips Petroleum Co. For sale by Byron Motion Pictures, in

English, French, Spanish, or Russian, at $25.48 per print, including shipping case, F.O.B. Washington, D. C. English version for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This technical film uses animation to show precisely how the USAEC's 250 Mw(t) Advanced Test Reactor design utilizes multiple flux traps to achieve exceptionally high neutron density in nine independent test loop positions. It describes the clover leaf, enriched fuel annulus that circumscribes the nine flux trap test positions, and the moving control components which vary flux and power in each test position. ATR was designed by Ebasco Services, Inc., as prime contractor, with Babcock & Wilcox Co. as nuclear subcontractors. Phillips Petroleum Co. prepared the conceptual design, and will operate the reactor.

THE ARGONAUT (1957). 15½ minutes, color.

Produced by USAEC's Argonne National Laboratory. For sale by Byron Motion Pictures, at $52.42 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters, field libraries, and Argonne National Laboratory, 9700 South Cass Ave., Argonne, Ill. Cleared for television.

The Argonaut (Argonne's Nuclear Assembly for University Training) is a low-power training-research reactor. This semitechnical film outlines the need for such a reactor in the USAEC's program and its applications to the International School of Nuclear Science and Engineering at Argonne. The design features, operation, and some of the many applications are described.

ARGONNE FAST SOURCE REACTOR (1960). 9 minutes, color.

Produced by USAEC's Argonne National Laboratory. For sale by Byron Motion Pictures, at $24.68 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from the USAEC field libraries and Argonne National Laboratory, 9700 South Cass Ave., Argonne, Ill. Cleared for television.

The Fast Source Reactor is a laboratory source of neutrons—not an experimental reactor—with a power level of 1000 watts. The film describes the reactor assembly and its usefulness as a readily available source of neutrons in a wide range of flux levels and flux spectra. The reactor was designed and built by ANL's Idaho Division at the USAEC's National Reactor Testing Station, Idaho. By animation and live action, information is given on the core and its positioning, two methods of changing reactivity, the cooling system, the thermal column, and the various access-beam holes. Its uses include the following: beams to test neutron spectrometers and checking complex instrumentation prior to use in operating reactors.

ARGONNE GAMMA IRRADIATION FACILITY (1957). 20 minutes, color.

Produced by USAEC's Argonne National Laboratory. For sale from Byron Motion Pictures, at $35.56 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters, field libraries, and Argonne National Laboratory, 9700 South Cass Ave., Argonne, Ill. Cleared for television.

The Argonne Gamma Irradiation Facility utilizes the radiation from fission products to provide a gamma irradiation flux up to 2 million roentgens per hour for research purposes. Irradiation service is made available to private and governmental research organizations. This semitechnical documentary film shows how the intense gamma rays from spent-fuel elements removed from the Materials Testing Reactor are used at Argonne for irradiation services. The arrangement for handling the fuel elements and the samples to be irradiated are described. Pictures of the results of typical food irradiation studies are included.

ARMOUR RESEARCH REACTOR (1958). 16½ minutes, color.

Produced by Atomics International. For sale by Byron Motion Pictures, at $54.33 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries, and from Atomics International, P. O. Box 309, Canoga Park, California. Cleared for television.

This film shows the design, fabrication, and operation of the first private nuclear energy reactor designed specifically for industrial research—the 50,000-watt solution type reactor built by Atomics International for the Armour Research Foundation, Chicago.

BUILDING FOR ATOMIC ENERGY (1958). 21 minutes, color.

Produced by the USAEC's Savannah River Plant. For sale by the Calvin Productions, at $71.00 per print, including shipping case, F.O.B. Kansas City, Mo. Available for loan (free) from USAEC headquarters, field libraries, and the Savannah River Plant, Aiken, South Carolina. Cleared for television.

This semitechnical film covers the construction of the USAEC's Savannah River Plant, the largest single construction project ever undertaken by the USAEC. The picture shows the major structural requirements created by the atomic production buildings; the various types of supporting buildings and structures; and the wide application of all phases of the construction industry required to build the plant.

CONSTRUCTION OF THE ARGONNE RESEARCH REACTOR (1955). 12½ minutes, black and white.

Produced by USAEC's Argonne National Laboratory. For sale

from Colburn Laboratory, at $15.48 per print, including shipping case, F.O.B. Chicago, Ill. Available for loan (free) from USAEC headquarters, field libraries, and Argonne National Laboratory, 9700 South Cass Ave., Argonne, Ill. Cleared for television.

This film shows some of the important stages in the construction of CP-5, the Argonne research reactor, which is a heavy-water reactor, operating at a normal power level of 1000 kw. By showing various stages in the construction of this reactor, the film illustrates many of the important design features.

ENGINEERING TEST REACTOR ("Long Version") (1958). 22 minutes, black and white.

Produced by the USAF's Lookout Mountain Air Force Station for the Idaho Operations Office of the USAEC. For sale by Byron Motion Pictures, at $23.57 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This technical film discusses the design, construction, operations, and some of the uses of the nation's largest and most advanced nuclear test facility. Among other uses, the Engineering Test Reactor acts as a research tool in the development of economic nuclear power by testing effects of intense neutron and gamma-ray bombardment on the engineering components of reactors under design.

ENGINEERING TEST REACTOR ("Short Version") (1958). 14 minutes, color.

Produced by W. A. Palmer Films Inc., San Francisco, Calif., for Kaiser Engineers, Oakland, Calif. For sale by Byron Motion Pictures, at $46.81 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This film shows the design and erection of the USAEC's Engineering Test Reactor at the National Reactor Testing Station in Idaho. The film, produced by Kaiser Engineers, is a shorter (14-minute) color version of the subject matter similar to the USAEC-produced 22-minute film of the same title.

THE MANY FACES OF ARGONNE . . . . . See page 36

MIT RESEARCH REACTOR (1958). 18 minutes, color.

Produced by Ballantine-Horter, Boston, Mass., for ACF Industries, Inc. For sale by Byron Motion Pictures, at $58.03 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This film is a step-by-step record of construction of the world's first privately owned heavy-water research reactor, designed and built by ACF Industries, Inc., for the Massachusetts Institute of Technology. It is a 1000-kw heavy-water-moderated and -cooled CP-5 type reactor, producing fluxes in excess of 10^{13} neutrons/cm^2/sec. It includes a special medical therapy room providing new approaches to nuclear medical research techniques. The film shows construction phases of the reactor, associated nuclear equipment, containment shell, and radiation shielding.

NAVAL RESEARCH LABORATORY REACTOR (1958). 21 minutes, color.

Produced by the U. S. Navy Photographic Center for the U. S. Naval Research Laboratory. For sale by DuArt Film Laboratories, at $67.05 per print. Available for loan (free) from USAEC headquarters and field libraries and the U. S. Navy. Cleared for television.

This semitechnical film is a guided tour through the Naval Research Laboratory's pool type, 100-kw research reactor facility in Washington. All visible components are pictured and described. Action includes startup, operation of controls, and underwater shots of the Čerenkov radiation. Composition of fuel elements, assembly of a core, and methods of exposing samples are explained by cutaway drawings and animation. Several experiments, representative of the type of research performed with the reactor, are described.

NUCLEAR REACTORS FOR RESEARCH (1955). 15 minutes, color.

Produced by Atomics International. Not for sale. Available for loan (free) from USAEC headquarters and field libraries or Atomics International, P. O. Box 309, Canoga Park, Calif. 91305. Cleared for television.

This film explains the basic design of the small homogeneous water-boiler reactor type and describes the components and the various steps in the construction of a small homogeneous reactor. Operation of the reactor is described, and research uses are illustrated.

OAK RIDGE RESEARCH REACTOR (1958). 20 minutes, color.

Produced by USAEC's Oak Ridge National Laboratory. For sale by Byron Motion Pictures, at $65.68 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters, field libraries, and Oak Ridge National Laboratory, Oak Ridge, Tennessee. Cleared for television.

This film summarizes the components, facilities, uses, and operation of the Oak Ridge Research Reactor, a tank type, heterogeneous reactor, immersed in a pool, designed to operate at 20 to 30 Mw.

RESEARCH REACTORS—USA (1958). 38 minutes, color.

Produced for the USAEC by the Los Angeles Division, Lytle Corp. Prints for sale (made from a master) from Byron Motion Pictures, at $104.06 per print, including shipping case, F.O.B. Washington, D. C. Prints for sale (made from the original) from Lookout Mountain Air Force Station, at about $167.18. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This semitechnical film presents, via live action and animation, a summary of the major types of research reactors—swimming pool, tank, water boiler, and graphite moderated—with descriptions of their uses in research, industry, chemistry, physics, metallurgy, biology, and medicine. Used as illustrations are the following reactors: CP-5 (Argonne), University of Michigan reactor, Omega West (Los Alamos), (Armour), Brookhaven, Argonaut (Argonne), 10-watt solution type (Atomics International), and the solid-homogeneous (Aerojet-General Nucleonics).

RESTORATION OF THE NRX REACTOR (1959). 23 minutes, black and white.

Produced, under the close technical supervision of, the USAEC and the Atomic Energy of Canada Ltd., by the U. S. Department of Agriculture, Motion Picture Service. For sale by the producer, at $35.22 per print, including shipping case. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This film discusses the 14-month repair and restoration of the NRX Reactor at Chalk River, Ontario, following a rapid superoperational power level excursion (the first nuclear reactor runaway in history) and describes the 1959 safety system of the 40-Mw reactor. Film footage made during actual restoration is supplemented by studio explanation with a reactor model. Depicted are the unusual and hazardous problems complicating repairs: high levels of radioactive contamination in work areas; continuation of water cooling on high irradiated fuel rods to prevent auto-ignition; creation of disposal facilities in subzero weather for a gross quantity of cooling water mixed with highly active fission products; corrosion-inhibiting preservation of irradiated fuel rods; decontamination of large pieces of equipment and reactor components; and rebuilding a reactor that had not been designed initially for major repair. Illustrated are unique methods and tools for locating radioactive products lodged in piping and auxiliary equipment, snaring and removing broken pieces of radioactive fuel rods, suppressing large areas of residual building contamination, and removing and decontaminating equipment, shielding, and heavy water. In addition to persons interested in nuclear reactors, the film has particular value to reactor technology and operation for assessing safety system

failure and associated problems and hazards of returning a reactor to operation.

SPERT DESTRUCTIVE TEST, PART-I, On Aluminum, Highly Enriched Plate Type Core (1965). 15 minutes, color.

Produced by Phillips Petroleum Company as contractor for the USAEC at the National Reactor Testing Station, Idaho. For sale by Telefilm Industries, at $75.62 per print, including shipping case, F.O.B. Hollywood, California. Available for loan (free) from USAEC headquarters and field libraries. NOT cleared for television.

This technical film documents the destructive test program of a highly enriched, aluminum plate-type core in the SPERT-I reactor at the National Reactor Testing Station in Idaho. Beginning with the initial phases of the program, the film portrays special facility modifications required and the design and testing of instrumentation. Transient testing into the region of limited core damage is described, including views of the resultant rippled, bowed, and melted fuel plates. Slow motion studies, in both color and black and white, show the effects of the final core destruction test on November 5, 1962. The post-destructive core disassembly and examination is shown in detail, and the film concludes with a summary of the reactor power, fuel temperature, transient pressure, and energy release.

ZERO POWER REACTOR III (1958). 10 minutes, color.

Produced by USAEC's Argonne National Laboratory. For sale by Byron Motion Pictures, at $39.12 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters, field libraries, and Argonne National Laboratory, 9700 South Cass Ave., Argonne, Ill. Cleared for television.

This technical film illustrates the Zero Power Reactor III (ZPR-III) operating methods to study fuel configurations and their effect upon critical assembly, particularly operation and current applications in Argonne National Laboratory's Fast Reactor Program.

SAFETY, WASTE DISPOSAL, AND MONITORING

AIR AND GAS CLEANING FOR NUCLEAR ENERGY (1964). 30 minutes, color.

Produced by Oak Ridge National Laboratory. For sale by Calvin Productions, at $86.23 per print, including shipping case. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This technical film portrays the need for, and development of, high efficiency filters for the nuclear energy industry; the manufacture of

such filters; their inspection at USAEC Quality Assurance Stations before installation at nuclear sites; the in-place testing of filters as an effective contamination control program; and current research and development in the area of high efficiency mechanical air cleaning. The R&D activity, filmed at Harvard Air Cleaning Laboratory, Oak Ridge National Laboratory, and Edgewood Arsenal, covers iodine collection systems; fine aerosol reaction on filters; in-pile and out-of-pile fuel meltdown studies; the production and dispersion of solid aerosols in an exploding wire aerosol generator; foam tests to encapsulate radioactive materials; rare gas absorption studies; experiments with diffusion boards as a gas and particulate removal surface; cleaning of stainless steel wool filters with shock waves; and the dispersal of radioactive wastes by incineration.

ATOMS ON THE MOVE: TRANSPORTATION OF RADIOACTIVE MATERIALS (1966). 20 minutes, color.

Produced by Robert E. Leamy Productions for the USAEC's New York Operations Office. For information about print sales, inquire at the Audio Visual Branch, Division of Public Information, USAEC, Washington, D. C. 20545. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This non-technical film surveys the various means of transporting radioactive materials and the safety aspects underlying their packaging and handling. Using animation and live action photography, the film illustrates that by their very nature, radioactive materials are varied and so are the potential hazards associated with shipping and using them. By evaluating the form of the material and the kind and the quantity of radioactivity, one may determine how the materials are properly packaged for shipment. Most radioactive materials are safely shipped by common carrier. The film shows typical shipments enroute: atoms on the move everyday, everywhere by train, truck, aircraft and ship. Varied items are dealt with: ores; atomic fuel for reactors; spent fuel being returned for processing; atomic weapons; radioisotopes for medicine, research and industry; and atomic wastes being shipped for disposal. The film discusses responsibilities of agencies such as the AEC, the ICC, Bureau of Explosives, Federal Aviation Agency, Coast Guard and state and local offices. Also shown are some aspects of safety research and development designed to limit the consequences of an accident involving these materials. An accident situation and clean-up are shown. We learn that radioactive materials are invaluable tools and products in today's industry and in our daily lives, and how modern transportation moves these materials quickly, quietly, and safely.

EXPERIMENTS IN CONTROLLING BRUSH FIRES WITH DETERGENT FOAM (1965). 6½ minutes, color.

Produced by USAEC's Argonne National Laboratory. For sale by Color Service, at $14.79 per print, including shipping case, F.O.B. New York. Available for loan (free) from USAEC headquarters, field libraries, and Argonne National Laboratory, 9700 South Cass Ave., Argonne, Illinois. Cleared for television.

Grass, brush, and forest fires cause an annual loss in the United States close to a quarter billion dollars. This film describes a series of tests by Argonne National Laboratory to explore the use of detergent foam as a fire break. Experiments were conducted with the Fire Protection Department's forestry jeep, which has a 265-gallon water tank and rotary gear pump. A detergent and water solution is sprayed on a nylon mesh while air is forced through the openings in the mesh by a large fan. This produces a detergent foam which has been expanded approximately 1000 times. The foam is delivered through a canvas tube at the rate of 5000 cubic feet of foam per minute. In these tests detergent foam appeared to be effective.

FIRE FIGHTING IN THE NUCLEAR AGE (1960). 14 minutes, color.

Produced for the USAEC by the Office of Information, Idaho Operations Office, USAEC, and the Calvin Productions. For sale by the Calvin Productions, at $68.50 per print, including shipping case, F.O.B. Kansas City. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This film (produced primarily for fire departments, health officials, and industrial personnel, under the supervision of the Health and Safety Division of the Idaho Operations Office) points out that radiation is just another hazard in fire fighting which can be handled with proper training. The film uses the USAEC Fire Department at the National Reactor Testing Station in Idaho as the example, showing its training. Techniques and procedures are illustrated in the fighting of a mock fire created for this film: A constant air monitor automatically rings the alarm when the fire reaches stored radioactive materials and radiation is released; the fire headquarters check the building inspection report to find out where radioactive materials are stored in the burning building; fire trucks approach the building upwind to avoid possible airborne radiation; firemen don special protective clothing (i.e., shoe covers, gloves, and self-contained respiratory masks) in addition to standard protective gear; the entranceway to the burning building is monitored before firemen enter, and frequent radiation checks are made during the fire-fighting period; firemen observe time-distance-shielding plan to protect themselves (remain in radiation area shortest possible time, stay as far away from burning radioactive materials as possible, place available shielding material between themselves and the fire); each fireman is checked with a monitor as he leaves the fire; all protective clothing is removed and stacked for monitoring and

decontamination; each man checks his film dosimeter to see if he was exposed to radiation; fire-fighting equipment is checked for contamination; personnel are rechecked for radiation after removal of protective gear; film badges are checked; and all personnel scrub down.

FUEL ELEMENT BURNING EXPERIMENT (1959). 24 minutes, color. Produced by the USAEC's Idaho Operations Office and the U. S. Department of Agriculture, Motion Picture Service, for the USAEC. For sale by the Motion Picture Service at $101.00 per print, including shipping case. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This film describes an experiment at the National Reactor Testing Station, Idaho, in which aircraft reactor fuel elements, together with other materials, were melted in a simulated aircraft crash. The experiment consisted of two phases: the first (Phase A) used jet fuel as the combustible and the second (Phase B) used Thermite to produce high temperature to assure melting. In Phase A, melting did not occur, and no radioactivity was released. In Phase B, melting did occur, with the release of a small amount of activity (10,000 curies of fission products) in the National Reactor Testing Station out to a distance of ½ mile. The total experiment provided preliminary experimental data upon which to base further experiments and to make very preliminary estimates of the hazards of mobile reactors in an accident situation. (The film should be of interest to persons concerned with: the release of fission products from radioactive fuel elements when the element is completely melted; the results obtained by the destruction of fuel elements containing significant fission products; development of aircraft reactors; and generalized safety research. The film should be of particular interest to personnel associated with organic-moderated facilities in which fire hazard is a factor, radiological health and safety activities, the Radiological Assistance Program, etc.)

GROUP SHELTER (1960). 10 minutes, color.

Produced for the USAEC's Civil Effects Branch by the U. S. Department of Agriculture, Motion Picture Service. For sale by the producer, at $40.00 per print, including shipping case. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This film, understandable to the lay audience, will be of interest to both technical and nontechnical personnel concerned with the protection of large groups from the effects of nuclear weapons. The film describes an underground corrugated-metal arch shelter design for the protection of 100 persons for two weeks or more. Also shown, via a model, are the aboveground entryway and the underground compartments for sleeping, living, services, and utilities. The design, based

on experience gained during the 1957 effects tests at the Nevada Test Site and subsequent engineering studies, is described in detail in Civil Effects Test Operations Report CEX-58.7, "AEC Group Shelter."

HIGH ACTIVITY WASTE (A Geneva—1964 film). 17 minutes, color.

Produced by USAEC's Argonne National Laboratory. For sale by Byron Motion Pictures, in English, French, Spanish, or Russian, at $36.75 per print, including shipping case, F.O.B. Washington, D. C. English version available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

As the nuclear power industry expands, the handling and ultimate disposal of high activity waste becomes of increasing importance. This technical film describes newly developed methods for solidifying high activity wastes, reducing their volume by a factor of 10, into solids that are almost chemically inert. The process includes pot and spray calcination, and the fluidized bed calciner with a capacity of 100 liters per hour of liquid waste. Techniques being developed to produce glasslike solids from powdered wastes and directly from liquids are also shown. The use of salt mines for disposal of solid wastes is discussed.

KINETIC EXPERIMENT ON WATER BOILERS (1958). 15 minutes, color.

Produced by Atomics International for the USAEC. For sale by Byron Motion Pictures, at $54.63 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries, and Atomics International, P. O. Box 309, Canoga Park, California. Cleared for television.

This film discusses a USAEC-sponsored study by Atomics International of the dynamic behavior of the homogeneous solution type nuclear reactor, demonstrating the inherent safety characteristics of aqueous homogeneous reactors in the event of an unforeseen release of large amounts of reactivity.

LIVING WITH A GLOVED BOX (1964). 15 minutes, color.

Produced by the USAEC's Lawrence Radiation Laboratory at the University of California. For sale by W. A. Palmer Films, at $66.02 per print, including shipping case, F.O.B. San Francisco. Available for loan (free) from USAEC headquarters and field libraries, as well as the Graphic Arts Dept., Lawrence Radiation Laboratory, P. O. Box 808, Livermore, Calif. Cleared for television.

This semitechnical film explains the principles and techniques of working with a gloved box—an enclosure designed for handling radioactive materials of low activity which present a hazard primarily through

inhalation and ingestion. The film opens with an explanation of how air currents and turbulences carry various substances, some of which may be hazardous. It shows why highly toxic materials like plutonium can best be handled in a gloved box. The principles of the gloved box are then explained in detail. Such items are covered as: the air flow and pressures within the box; the "bagging in" and "bagging out" of materials; the procedures for changing gloves on the box; the changing of the filter; and a method for handling a fire within the box.

LIVING WITH RADIATION (1958). 28 minutes, color.

Produced by Lookout Mountain Air Force Station, USAF, for the USAEC's Idaho Operations Office. For sale (from master material) from Byron Motion Pictures, at $92.59 per print, including shipping case, F.O.B. Washington, D. C., or (from original material) from Lookout Mountain Air Force Station, USAF, at $172.40 per print, including shipping case. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This semitechnical documentary film discusses in detail the radiation-safety program of the national atomic energy program, using the procedures at USAEC's National Reactor Testing Station in Idaho as the typical illustrative example. The film covers the separation-distance factor; the storage and/or dispersal of radioactive wastes; protection of populations, water, crops, and livestock by air and environmental monitoring; protection of workers by film badges, protective clothing, radiation counters, shielding, remote-control devices, decontamination procedures, and biochemical studies.

PRACTICE OF RADIOLOGICAL SAFETY (Radioisotopes Series). . . . . See page 76

PRIMER ON MONITORING (1949). 27 minutes, color.

Produced by the Film Dept., UCLA, West Los Angeles, Calif., for the University of California Medical Center. For sale from Consolidated Film Industries, at $130.12 per print, including shipping case, F.O.B. Los Angeles. Available for loan (free) from USAEC headquarters and field libraries or UCLA. Cleared for television.

The film discusses the basic makeup of atoms and the types of radioactivity. Principles of radiation detection and measuring instruments are displayed, including a method of calibrating survey meters. The film also illustrates the penetrative ability of the various types of radiation encountered in monitoring and sets forth radiation-monitoring procedures best used in a chemical laboratory. (Some of the instruments used in this film are obsolete by current standards, although the principles involved and discussed are still valid.)

PHYSICAL PRINCIPLES OF RADIOLOGICAL SAFETY (Radioisotopes Series) . . . . . See page 75

RADIATION IN PERSPECTIVE (1963). 43 minutes, color.

Produced by the U.S. Department of Agriculture, Motion Picture Service, for the USAEC, under the technical direction of the Commission's Division of Operational Safety. For sale by the producer, at $194.00 per print, including shipping case. Available for loan (free) from USAEC headquarters and the field libraries. Cleared for television.

The film, in the form of a lecture by Commission Safety Engineer Francis L. Brannigan, presents the salient points of an approach to the understanding of the radiation problem which has been found useful for persons requiring a layman's understanding of the nature of radiation—such as teachers' groups, public safety officials, transportation executives, insurance executives, service clubs, colleges and universities, etc. The film will also be useful to those technically qualified, since it demonstrates proven techniques for explaining the radiation hazard to the layman.

Since it is basic to the acceptance of any hazard that some benefit is expected from it, the lecture-film briefly summarizes some of the beneficial uses of radioactive materials—in medicine, agriculture, industry, systems for nuclear auxiliary power, food sterilization—that justify acceptance of the hazard. The lecturer then explains briefly the internal radiation problem, and in detail the external radiation problem. Information is given on ionization, background levels of radiation, the roentgen, the various radiation levels required to produce immediate injury and low-level radiation exposures over long periods of time.

The lecturer discusses the somatic effects (on the individual) and genetic effects (on future generations) and makes a comparison of the acceptable-versus-dangerous levels for radiation with that of the levels for carbon monoxide, to show the conservative nature of radiation regulations. An explanation is given of time, distance, and shielding and how they are used to control external radiation exposure. The lecturer points out that the question is not radiation versus no radiation, but rather how much more radiation exposure people can accept consistent with the other hazards of our environment—all balanced against the tremendous industrial, medical and research benefits of the nuclear age.

He summarizes and concludes: "Radiation is another of the hazards with which we must deal as we make progress in our industrial age. Radiation energy in quantity can damage living tissue. However, within limits we can live with this problem so that we can obtain the benefits of the atomic age. This parallels our acceptance of other hazards. There is a tremendous spread between the routinely acceptable operat-

ing radiation levels and the dangerous levels—many thousands of times greater than the corresponding spread for other hazards. All radiation contributes to but is not the sole cause of mankind's genetic problems. The proportion due to atomic energy is very small. The conclusion is clear: we can enjoy the benefits of the nuclear age with safety to employees and the public."

RADIATION PROTECTION IN NUCLEAR MEDICINE . . See page 11

RADIOISOTOPES: SAFE SERVANTS OF INDUSTRY . . See page 27

RADIOLOGICAL SAFETY (Understanding The Atom Series) . . . . . See page 83

R-A-P: RADIOLOGICAL ASSISTANCE PROGRAM—TEAMWORK IN EMERGENCIES (1965). 26½ minutes, color.

Produced for the USAEC by J. L. Feierbacher with the technical assistance of AEC's Division of Operational Safety and AEC's Idaho Operations Office. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

Despite the extensive precautions taken, accidents do happen with radioactive materials. Through its Radiological Assistance Program the AEC maintains a nationwide organization by which radiological emergency assistance is made available. The detailed re-enactment of the steps and measures taken to deal with these radiological emergencies shows the operations of R-A-P teams as they put to work their specialized professional skills and equipment. This documentary film is aimed at the level of the educated layman—employees of state and local government, AEC and state licensees, personnel in the transportation industry, the military services, Civil Defense workers, and others concerned with emergency action involving radioactive materials.

The R-A-P team's effectiveness is shown to be dependent on the cooperation of other groups and individuals at different levels of government and business. To illustrate this, the film portrays three main incident stories: The first traces the hunt for a radioactive source lost from a small industrial plant. The trail via aircraft and police cars takes the R-A-P team to a municipal dump. The second case is the problem of leaking radioactive vapor from a sealed system in a research laboratory. The third is the story of a fire in a uranium products plant that gives an R-A-P team the additional public information job of coping with a community which mistakenly assumes it is threatened with a disaster.

REACTOR SAFETY RESEARCH (A Geneva–1964 film). 15 minutes, color.

Produced by USAEC's Argonne National Laboratory. For sale by Byron Motion Pictures, in English, French, Spanish, or Russian, at $44.49 per print, including shipping case, F.O.B. Washington, D. C. English version available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This technical film shows that conservative design is characteristic of nuclear power reactors, with elaborate safeguards to prevent the improbable accident. It points out that through reactor safety research the mechanisms of abnormal behavior, fission product release, chemical reactions, containment, and vapor cleanup systems are better defined, providing a basis for improvement in design features and reduction of costs.

REMOTE REPAIR AND MODIFICATION OF THE HRE-2 CORE VESSEL . . . . . See page 52

RESEARCH REACTOR SAFETY DEVICE (1958). 12½ minutes, color.

Produced by Atomics International for the USAEC. For sale by Capital Film Laboratories, at $39.90 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries, and Atomics International, P. O. Box 309, Canoga Park, California. Cleared for television.

As a significant step in reactor safety work, Atomics International has designed, built, and successfully tested a reactor safety "fuse," as part of the U. S. Atomic Energy Commission's reactor safety program. The device, designed to provide absolute protection by shutting down "pool" type reactors without the use of external controls, automatically and almost instantaneously shuts down research reactors if an abnormal operating condition occurs.

SAFETY EXPERIMENTS WITH A BOILING REACTOR (1955). 19½ minutes, black and white.

Produced by USAEC's Argonne National Laboratory. For sale from Colburn Laboratory, at $50.00 per print, including shipping case, F.O.B. Chicago, Ill. Available for loan (free) from USAEC headquarters, field libraries, and Argonne National Laboratory, 9700 South Cass Ave., Argonne, Ill. Cleared for television.

This film records a series of safety experiments with a prototype boiling-water reactor, consisting of a pressure vessel containing an assembly of uranium-bearing plates submerged in water, plus a control mechanism. The film shows a number of reactor excursions, some of which expel the water from the reactor; the last experiment shows the deliberate destruction of the reactor assembly, when the reactor is allowed to "run away."

THE SL-1 ACCIDENT, PHASES 1 AND 2 (1962). 40 minutes, color.

Produced for the USAEC's Idaho Operations Office by John Feierbacher. For sale (with prior authorization from the Audio-Visual Branch, Division of Public Information, USAEC) by Byron Motion Pictures, at $113.14 (from the internegative) per print, including shipping case, F.O.B. Washington. Available for loan (free) from USAEC headquarters and field libraries. NOT cleared for television, except with the express permission of the USAEC.

This semitechnical film on the SL-1 accident at the National Reactor Testing Station, Idaho, was produced primarily for nuclear industry and other technical, semitechnical, and educated lay-level groups interested in the Commission's work of studying and improving the methods and techniques of handling nuclear emergencies. A combination of actual and reenacted scenes, the film presents a concise résumé of what happened and how the USAEC and its operating contractors reacted to the situation, i.e., the activities associated with Phases 1 and 2 of the postaccident operations. (Phase 1 involved the location, rescue, and recovery of the three personnel and the determination of how much contamination had been released to the environment. Phase 2 involved determining whether the reactor was nuclearly safe.) Information on Phase 1 includes the type of small nuclear-power plant; training of military-reactor crews; search of the building by health physicists and observation of radiation levels and wreckage; location, rescue, and recovery of the three casualties; protective clothing and equipment and decontamination procedures for rescue teams; environmental monitoring by aircraft, radio-controlled air-sampling stations, film badges, radiation-detector readings, etc.; and collection and radiochemical analysis of materials. Phase 2 activities include the use of remote-controlled motion-picture and closed-circuit television cameras to study the reactor (reactor head, nozzles, core, control-rod shrouds, control-rod extensions and blades, fuel elements, central control rod, etc.). The reactor was found to be nuclearly safe so long as nothing was done to change its unmoderated condition. Radiochemical-activation analyses determined the nuclear-criticality origin and -energy release of the explosion, decontamination of surrounding roads, and confirmation that the accident had little or no adverse effect on the environment outside the immediate reactor area. At no time was there any serious hazard to people and animals, even in the close vicinity of the SL-1 site. Results of the investigation of the accident indicate a need for readily available high-range survey instruments, careful use of health physicists, preplanning, etc.; in addition, important information on reactor technology and the administrative procedures governing reactor development has resulted. Brief information is given on the start of Phase 3 work, involving the de-

contamination and disassembly of the reactor to determine what destroyed it.

THE SL-1 ACCIDENT, PHASE 3 (1962). 57 minutes, color.

Produced by the USAEC's Idaho Operations Office, John L. Feierbacher, consultant. For sale (with prior authorization from the Audio-Visual Branch, Division of Public Information, USAEC) by W. A. Palmer Films, Inc., at $202.88 per print, including shipping case, F.O.B. San Francisco. Available for loan (free) from USAEC headquarters and field libraries. NOT cleared for television, except with the express permission of the USAEC.

This is a semitechnical motion picture sequel to the USAEC's earlier film, "The SL-1 Accident, Phases 1 and 2" (1962). It is a factual and historic documentary report on what was done with the SL-1 reactor and building commencing about four months following the accidental nuclear excursion that occurred January 3, 1961. It features a step-by-step reenactment of the accident, animation of the events believed to have taken place during and immediately following the excursion, and a postulation of the cause. The film documents substantially the recovery operations specified under contract with General Electric Company, which was charged with: gathering evidence pertaining to the accident; preparing the facility for core removal; recovery of the reactor core for remote-control examination; demolition of the reactor building; decontamination of the SL-1 site and restoration to habitable status; and presentation of an accident analysis report to the USAEC.

Highlights of the film: a review of the SL-1 situation following completion of Phases 1 and 2 recovery operations, including the extent of radiation levels, their sources and locations; procedures and time restrictions ensuring the safety of workers engaged in decontamination and dismantling of reactor building; planning and construction of special burial ground for disposal of contaminated equipment; boroscope examination of vessel interior; trial life of vessel viewed by remote cameras; preparation of reactor building for removal of vessel and core; actual lifting and removal of reactor vessel and core; transporting the 13-ton vessel in a 20-foot-high concrete shielding cask 40 miles to a giant hot shop; vessel and core dissection by remote control viewed through thick shielding windows; laboratory examination of central control blade and shroud; laboratory analysis of boron strips, flux wires, fuel plates, etc.; maintenance crew reenacting assembly of central control rod blade and drive mechanism at time of accident; animated sequence showing succession of events postulated to have taken place inside the reactor vessel upon triggering of the excursion; explanation of the accident and verification of its overt cause (sudden and excessive withdrawal of central control rod blade); recapitulation of knowledge gained that may be helpful in dealing with or preventing similar accidents in the future.

"The SL-1 Accident, Phase 3" is of special interest to administrative, technical, semitechnical, military, contractor, and licensee personnel having responsibilities for the safe operation of nuclear reactors.

SNAPTRAN 2/10A WATER IMMERSION TEST (1965). 20 minutes, color.

Produced by Phillips Petroleum Company as contractor for the USAEC at the National Reactor Testing Station, Idaho. For sale by Telefilm Industries, at $88.75 per print, including shipping case, F.O.B. Hollywood, California. Available for loan (free) from USAEC headquarters and field libraries. NOT cleared for television.

This semitechnical documentary film portrays a test which investigated the effects of water immersion on a SNAP-10A reactor, a system designed to provide 500 watts of electric energy for powering equipment in a space satellite. Such an accident conceivably could occur if a SNAP-10A reactor mission aborted on launch and the reactor fell into water.

This film describes the basic components of the SNAP-10A reactor, its method of control, non-nuclear tests which established the reactor's physical state after terminal velocity entry into water, and the reactor's neutronic behavior when immersed in water. The testing site and supporting facilities are described. Step-by-step coverage includes preparing the reactor for testing, reactor operation, and preparations for the destructive test, including the functions of various supporting groups.

Shown are actual control room action and immediate post-test observation of the reactor remains by means of closed circuit TV. The destructive test itself is shown from six vantage points, including a variety of slow motion sequences, and ultra-high speed silhouette photography of the reactor vessel expansion during disassembly.

Animation and live scenes explain reactor behavior during the test and the subsequent radiological results. The information gained and how this information can be applied to assess nuclear accidents is discussed.

SPERT-I: REACTOR SAFETY EXPERIMENTS (1958). 32 minutes, color.

Produced for the USAEC's Idaho Operations Office by the USAF's Lookout Mountain Air Force Station. Prints for sale (made from a master) from Byron Motion Pictures, at $102.36 per print, including shipping case, F.O.B. Washington, D. C. Prints for sale (made from original material) by Lookout Mountain Air Force Station, USAF, at $176.66. Available for

loan (free) from USAEC headquarters and field libraries. Cleared for television.

This technical film on reactor safety investigations involves use of the Special Power Excursion Reactor Test (SPERT), a tank type, atmospheric pressure, heterogeneous reactor. SPERT was designed primarily for the study of reactor kinetics and safety parameters in functionally similar reactors. The film illustrates a number of intentionally induced power excursions.

SRE CORE RECOVERY FOLLOWING FUEL-ELEMENT DAMAGE (1962). 29½ minutes, color.

Produced by Atomics International for the USAEC. For sale by General Film Laboratories, at $95.00 per print, including shipping case, F.O.B. Hollywood. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This film, with animation, describes (1) design features of the Sodium Reactor Experiment (SRE) near Santa Susana, California (designed, constructed, and operated for the USAEC by Atomics International); (2) important operations attainments; (3) circumstances in 1959 which resulted in severe damage to the reactor core and release of about 10,000 curies of fission-product activity; (4) equipment, methods, and procedures employed to contain gaseous atmospheres, to remove radioactive debris (including pieces of fuel elements from the reactor system), and to replace affected core-moderator cans; and (5) modifications made to prevent similar future difficulties. Included are actual motion-picture scenes of the highly radioactive reactor core and animation of fuel-element damage and breakage. A relatively small number of men performed the recovery-work operations; none of the men received more than the standard permissible amount of radiation exposure, and there were no physical injuries. Demonstrated was the fact that extensive maintenance work can be conducted on the entire plant complex of a sodium-cooled nuclear-power reactor with a reasonable degree of effort. Development of the devices and techniques successfully utilized occupies an important position in reactor technology and provides significant information for other types of nuclear facilities.

TRANSPORTATION OF RADIOACTIVE MATERIALS, PART II, ACCIDENTS (1965). 34½ minutes, black and white.

Produced under the technical direction of the USAEC's Division of Operational Safety. For sale by the U. S. Department of Agriculture, Motion Picture Service, at $51.00 per print, including shipping case. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

The film, in the form of a lecture by Commission Safety Engineer Francis L. Brannigan, discusses the control of transportation acci-

dents involving radioactive materials. Liberal use is made of charts, pictures, actual packages, and off-screen film footage to show that only a small proportion of shipments of radioactive materials can present any real danger in the event of accident. ICC shipping labels are shown and explained and the regulations relating to individual packages briefly discussed. A typical package is opened step-by-step from the outer container down to the final inner container, holding a radioisotope. Included is a simulated accident with a leaking container which causes unnecessary alarm. A simulated accident which might cause serious consequences is shown. The question of radioactive material becoming airborne in an accident, the degree of hazard, and precautions to be taken are then discussed. Radioactive contamination, shipping of fissile materials, nuclear weapons accidents, and the availability of radiological assistance are discussed in turn.

TRANSPORTATION OF RADIOACTIVE MATERIALS, PART III, PRINCIPLES OF REGULATION (1965). 15½ minutes, black and white.

Produced under the technical direction of the USAEC's Division of Operational Safety. For sale by the U. S. Department of Agriculture, Motion Picture Service, at $31.00 per print, including shipping case. Available for loan (free) from USAEC headquarters and field libraries. NOT cleared for television.

This film, in the form of a lecture by F. L. Brannigan and D. E. Patterson, USAEC Safety Engineers, discusses the basic principles underlying two sets of regulations for the transportation of radioactive materials, those of the United States Interstate Commerce Commission and those of the International Atomic Energy Agency.

Using novel graphics, the speakers describe: Curie High Specific Activity, Low Specific Activity, dilution concentration, and ionization. A detailed explanation is given of the equation: "inherent ionizing ability" multiplied by "availability" equals "hazard." Availability is defined as the total mechanism by which the radioactive material gets into a position to ionize living tissue.

Each of the two regulation systems is analyzed separately to show how the form, packaging, and quantity of radionuclides of varying inherent ionizing ability are manipulated to produce an acceptable level of hazard. The framework presented is shown to be necessary for any system of regulation.

THE WOODEN OVERCOAT (1965). 14 minutes, color.

Produced for the USAEC by the Sandia Corporation. For sale by Calvin Productions, Inc., at $38.27 per print, including shipping case, F.O.B. Kansas City. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

Because radioactive materials are being shipped throughout the world in increasing quantities, research programs are being conducted to develop shipping containers for radioactive materials which are virtually accident-safe. In support of these programs, the United States Atomic Energy Commission has asked its contractors to submit designs for containers. Sandia Corporation of Albuquerque, New Mexico, has designed and tested a wooden outer shell for existing metal containers which will withstand a 30-foot drop, a one-hour petroleum fire, and 24-hour water immersion without the seal of the inner metal container of radioactive material being broken. This technical film report shows the development and testing of the wooden containers as well as the buildup of the containers from rings of plywood. Photography of actual drop tests and fire tests is included to demonstrate the resistance of the container to both impact shock and fire exposure. Results of tests show that a container having six-inch thick shells of fir plywood will adequately protect the inner metal container of radioactive material.

RADIOISOTOPES SERIES

The following eight films, comprising "Radioisotopes" Series, are black and white, cleared for television and are for sale from DuArt Film Laboratories. Listed below, with the description of each film, are the commercial sale prices. *There is a 10 per cent reduction for nonprofit organizations and a 35 per cent reduction for government agencies.* The films were produced by the U. S. Army Signal Corps for the Army Surgeon-General, with the technical assistance of the USAEC, during the period 1949–1952. The films are available on loan (free) from the following Army sources only: *(Please order from the nearest library listed below—using the USAEC headquarters library in Washington only if the other sources do not have the films available. THESE FILMS ARE NOT AVAILABLE FROM USAEC FIELD LIBRARIES.)*

Commanding General
First Army
Governors Island
New York, N. Y. 10004
Attn: Audio Visual Communications Center

Commanding General
Second Army
Ft. George Meade,
Maryland 20755
Attn: Audio Visual Communications Center

Commanding General
Third Army
Ft. McPherson
Atlanta, Georgia 30330
Attn: Audio Visual Communications Center

Commanding General
Fourth Army
Ft. Sam Houston
San Antonio, Texas 76841
Attn: Audio Visual Communications Center

Commanding General
Fifth Army
Ft. Sheridan
Chicago, Illinois 60035
Attn: Audio Visual Communications Center

Commanding General
Sixth Army
Presidio of San Francisco
San Francisco, California 94118
Attn: Audio Visual Communications Center

Commanding General
Military District of Washington
Washington, D. C. 20305
Attn: Audio Visual Communications Center

Medical Illustration Service
Armed Forces Institute of Pathology
Walter Reed Medical Center
Washington, D. C. 20012
Attn: Audio Visual Communications Center

AND, WHEN NOT AVAILABLE ELSEWHERE, USE:

Audio-Visual Branch
Division of Public Information
U. S. Atomic Energy Commission
Washington, D. C. 20545

FUNDAMENTALS OF RADIOACTIVITY (PMF-5145-A). 59 minutes.

Sale price: $76.74. For loan source see Army Field Library Listing, page 74.

This film traces uranium from prospector to the USAEC. It shows how uranium changes into other elements through radioactive decay and through nuclear fission. Mention is made of Einstein's equation $E = mc^2$, the atomic bomb, and use of nuclear power for industry. Stable and radioactive isotopes are explained, with isotope charts and energy level diagrams used to illustrate decay. Various radiations resulting from nuclear changes are described in detail. The nuclear reactor is described in terms of fission and moderation. Also shown are target materials introduced into a typical nuclear reactor and withdrawn as radioisotopes and the processing of fission products. More than fifty terms and concepts are defined and explained.

PHYSICAL PRINCIPLES OF RADIOLOGICAL SAFETY (PMF-5145-E). 51 minutes.

Sale price: $66.36. For loan source see Army Field Library Listing, page 74.

This film introduces concepts of internal and external and acute and chronic radiation exposure by means of a historical sequence on hazards associated with X-ray and radium therapy and radium-dial painting. A discussion of ionization from external and internal sources of alpha, beta, and gamma radiation, with detailed explanations of roentgen and "equivalent" or "energy" roentgen, is presented. Maximum permissible exposure and the theory of radiation-measuring instruments are also discussed. Formulas are developed for computing dosage rates from internal sources. Concepts of single and continued uptake, physical decay, and biological elimination of activity, biological

half life, and effective half life are considered. The responsibility of the radioisotope user to other members of the laboratory and to the public is emphasized.

PRACTICAL PROCEDURES OF MEASUREMENT (PMF-5145-C). 48 minutes.

Sale price: $62.48. For loan source see Army Field Library Listing, page 74.

This film explains the need for radiation measurements, the principles and use of various types of instrumentation (with emphasis on the Geiger-Mueller counter), and topics such as background, threshold value, and plateau and counting statistics. Sample preparation is demonstrated. The film also explains and demonstrates absolute and comparative activity measurements.

PRACTICE OF RADIOLOGICAL SAFETY (PMF-5145-F). 33 minutes.

Sale price: $43.03. For loan source see Army Field Library Listing, page 74.

This film depicts a visit through a radioisotope laboratory and discusses handling of radioisotope shipments; preparation of therapeutic doses; need for, and function of, a local radioisotope committee; laboratory design; decontamination; use of shielding; measurement of personnel exposure, and other topics pertinent to health safety.

PROPERTIES OF RADIATION (PMF-5145-B). 68 minutes.

Sale price: $88.43. For loan source see Army Field Library Listing, page 74.

This film shows a Geiger counter used to compare penetrations of alpha, beta, and gamma radiation and to derive their characteristic absorption curves. The beta-radiation section of the film presents the cloud-chamber electrostatic generator and beta-ray spectrometer, as well as the concepts of ionization, electron volt, beta-ray spectrum, neutrino, scattering, nonlinear absorption, and density thickness (mg/cm^2). The gamma-radiation section explains bremsstrahlung, photoelectric effect, Compton scattering, pair production, exponential absorption, absorption coefficient, and half thickness. The final section concerns the interpretation of composite absorption curves.

THE RADIOISOTOPE IN GENERAL SCIENCES (PMF-5147-C). 46 minutes.

Sale price: $59.87. For loan source see Army Field Library Listing, page 74.

This film shows that the radioisotope is a research tool adaptable to tracer investigations in all branches of general science by tracing eight experiments illustrating how radioisotopes can be used in metallurgy, chemistry, biochemistry, and plant physiology, shown in

the order of increasing complexity as follows: (1) self-diffusion of solid copper; (2) study of vapor pressure over metallic silver; (3) exchange of chloride ions in solid and liquid; (4) exchange of sodium and potassium through cell wall; (5) rearrangement of atoms within a molecule, Wolff rearrangement of a diazoketone; (6) metabolism of cholesterol from sodium acetate in liver; (7) fate of carbon atoms during metabolism of glycine in blood; and (8) tracing the chemical path of carbon during photosynthesis in algae. Methodology of tracer research is illustrated, and techniques such as isotope dilution and two-dimensional paper chromatography are introduced.

THE RADIOISOTOPE: METHODOLOGY (PMF-5145-D). 33 minutes.

Sale price: $43.03. For loan source see Army Field Library Listing, page 74.

This film contains a historical sequence showing the early work of Hevesy in studying plant metabolism with naturally occurring radiolead, after which it explains seven criteria for setting up a tracer experiment: (1) radiochemical purity, (2) single chemical state, (3) elimination of exchange error, (4) knowledge of the degree to which the labeled molecules remain intact, (5) avoidance of isotope effect, (6) avoidance of chemical effects, and (7) avoidance of radiation effects. The film also illustrates the relative importance of economy of time and materials and accuracy by depicting a typical biological tracer experiment from the formation of an idea to the final results.

RADIOISOTOPES IN AGRICULTURAL RESEARCH (PMF-5147-B). 41 minutes.

Sale price: $53.41. For loan source see Army Field Library Listing, page 74.

This film explains the following three classes of work: (1) use of ^{32}P in large-scale field tests of fertilizers; (2) use of ^{60}Co in micronutrient studies with large domestic animals (a related study concerning the incorporation of inorganic cobalt into vitamin B_{12} is included); and (3) use of ^{45}Ca in macronutrient problems. The film also discusses other ways in which radioisotopes are used in agricultural research. Health safety procedures and techniques unique to large-scale field and animal research are stressed.

UNDERSTANDING THE ATOM SERIES

This semitechnical lecture-film series is designed for inclusion in a high-school senior-level chemistry or physics course, or it could be used as an introductional unit in nuclear science at the college level. The lecture-demonstrations are presented by Dr. Ralph T. Overman, Chairman, Special Training Division of the USAEC's Oak Ridge Institute of Nuclear Studies.

ALPHA, BETA, AND GAMMA (1962). 44 minutes, black and white.

Produced by the former New York University Television Center under the direction of the USAEC's Division of Isotopes Development. For sale by Byron Motion Pictures, at $47.12 per print, including protective film treatment and shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

The film gives some insight into the origin and nature of alpha, beta, and gamma radiation. After a short discussion of the methods of describing atoms and the introduction of the energy-level concept, the lecturer introduces the potential-energy well model of the nucleus. This, together with the barrier model, is used as the frame of reference for a variety of other nuclear concepts. The energetics in alpha emission and the Gamow tunneling effect are used to describe alpha-ray emission and the energy levels in the nucleus. The lecturer discusses neutron absorption leading to the formation of nuclei having neutron–proton ratios differing from stable or naturally occurring nuclei. The transformation of excess neutrons into negative beta radiation and the return to stability are considered in some detail. Similarly, gamma radiation arising from a nuclear cooling process is described. The nuclear well model is then used to introduce decay schemes.

THE ATOM IN PHYSICAL SCIENCE (1964). 26 minutes, black and white.

Produced by the Educational Broadcasting Corporation, New York City, under the direction of the USAEC's Division of Nuclear Education and Training and the Oak Ridge Institute of Nuclear Studies. For sale by Byron Motion Pictures, at $33.75 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This film is a lecture by Dr. Glenn T. Seaborg, Chairman of the U. S. Atomic Energy Commission, who is introduced by Dr. Ralph T. Overman, Chairman, Special Training Division of the USAEC's Oak Ridge Institute of Nuclear Studies and regular lecturer of the series. Dr. Seaborg outlines briefly the types of experiments which were used in the production of transuranium elements. These have been discovered using exceedingly ingenious approaches involving quite complex electronics and highly refined chemical techniques. Various sources have been employed in producing the new elements. These have included various types of accelerators, uranium reactors, and in several cases the first production of elements was in weapons testing experiments. The higher atomic number elements have been produced by the bombardment of targets with nuclei such as boron and nitrogen. Dr. Seaborg points out that elements not yet discovered will be char-

acterized by very short half lives and will require electronic means for their testing rather than chemical techniques.

The film time discusses applications to other chemical problems such as the mechanism of photosynthesis and the use of special techniques such as isotope dilution analysis. Of considerable interest also is the description of carbon-14 dating.

The lecturer closes with a strong statement regarding the need for scientists and the importance of good scientific training in schools.

NUCLEAR REACTIONS (1963). 29½ minutes, black and white.

Produced by the Educational Broadcasting Corporation, New York City, under the direction of the USAEC's Division of Nuclear Education and Training. For sale by Byron Motion Pictures, at $33.06 per print, including protective film treatment and shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and the nine field libraries. Cleared for television.

This segment of the series continues the discussion of the film "Understanding the Atom: Alpha, Beta, and Gamma," and involves some of the basic concepts of nuclear reactions. Use is made of the nuclear well model as a useful teaching diagram. Neutron capture processes are described with the gamma emission and particle ejection reactions being studied. Nuclear fission is also discussed. As an example of the calculations involved in nuclear reactions, the film describes the activation of a gold sample in a nuclear reactor. Emphasis is placed on the minute quantities which can be detected with the subsequent applications to the technique of activation analysis. It is shown that hundredths of a part per billion of certain materials can be detected by nuclear techniques.

PROPERTIES OF RADIATION (1962). 30 minutes, black and white.

Produced by the Educational Broadcasting Corporation, New York City, under the direction of the USAEC's Division of Isotopes Development. For sale by Byron Motion Pictures, at $32.06 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This film includes a discussion of general problems of radiation decay, such as the laws of radioactive decay, including the concept of half life. Statistical considerations are introduced, and the basic notion of the standard deviation in counts expected in various experiments is described. The energy spectrum from alpha and beta emitters is considered, and the use of absorption curves to study the energy distribution of beta radiation is introduced. The density thickness expressed in milligrams per square centimeter is introduced as a useful term. The film also considers problems of self-absorption, specific activity, and back-scattering of radiation.

RADIATION AND MATTER (1962). 44 minutes, black and white.

Produced by the former New York University Television Center under the direction of the USAEC's Division of Isotopes Development. For sale by Byron Motion Pictures, at $45.95 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

The film, which considers the interaction of radiation with matter, develops the various processes by which alpha, beta, and gamma radiation give up energy to their surroundings. The similarities and differences of alpha and beta particles are considered, with emphasis on the methods by which ionization occurs. It is pointed out that, since the interaction of radiations in the absorption process takes place essentially only with orbital electrons of the atoms, the density of electrons in matter is the determining factor. The relation between energy of a particle and the number of ion pairs formed is also explained. The lecturer follows with a discussion of gamma, or electromagnetic radiation, which is described as a nonionizing event in terms of the initial interaction between photons and atoms. Four possibilities of gamma-ray absorption (excitation, photoelectric effect, Compton effect, and pair production) are discussed. The viewer, however, is alerted to the fact that there is only a certain probability that one particular process may take place rather than another, depending upon the energy of the gamma ray. This probability, expressed as absorption coefficient, is then related to each of the four absorption processes.

RADIATION DETECTION BY IONIZATION (1962). 30 minutes, black and white.

Produced by the Educational Broadcasting Corporation, New York City, under the direction of the USAEC's Division of Isotopes Development. For sale by Byron Motion Pictures, at $32.53 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

The basic principles of ionization detectors are described, particularly in relation to the pulse height as a function of voltage curves. Brief descriptions of ionization chambers, proportional counters, and Geiger counters are included, and examples of instruments operating in these regions are shown. Special consideration is given to Geiger counters, including the mechanism of gas quenching and the determination of a counting-rate plateau. The resolving time of a counter is discussed, as well as various components of a practical instrument, including amplifiers and scalers.

RADIATION DETECTION BY SCINTILLATION (1962). 30 minutes, black and white.

Produced by the Educational Broadcasting Corporation, New York City, under the direction of the USAEC's Division of Isotopes Development. For sale by Byron Motion Pictures, at $31.77 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

A short review of gamma interactions with matter is shown, with particular reference to useful scintillation crystals. The scintillation process is described, and the efficiency of the conversion of gamma radiation to visible light in the scintillator is discussed. Solid and liquid scintillators are shown along with special detection devices using this principle. A description of the operation of a photomultiplier tube is given, and the concept of pulse height is developed. The principle of operation of a pulse-height analyzer is shown, and the spectrum obtained with such an instrument is shown and discussed. Brief mention is made of solid-state radiation detectors.

RADIOISOTOPE APPLICATIONS IN INDUSTRY (1964). 26¼ minutes, black and white.

Produced by the Educational Broadcasting Corporation, New York City, under the joint direction of USAEC's Divisions of Isotope Development and Nuclear Education and Training. For sale by Byron Motion Pictures, at $28.98 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This film discusses some of the practical, simple, and easily understood methods of putting radioisotopes to work in industry. The program features Dr. Paul C. Aebersold, Director, Division of Isotope Development, USAEC, who is introduced by Dr. Ralph T. Overman, Chairman, Special Training Division of the USAEC's Oak Ridge Institute of Nuclear Studies and regular lecturer of the series. Using actual radioisotope sources, Dr. Aebersold gives various demonstrations of the degree of their penetrating radiations, the extent to which several types of materials can reduce them and the sensitive methods of detecting them. He explains how the principles involved in the demonstrations are applied to practical uses in industry. Narrating over film, he tells of the actual use of radioisotope gauges in tire plants and steel mills, of radioisotope tracers used in the petroleum and chemical industries, of radioisotope density gauges used in food plants and of other uses of radioisotopes in industry which improve the efficiency of production and the quality of the product.

RADIOISOTOPE APPLICATIONS IN MEDICINE (1964). 26 minutes, black and white.

Produced by the Educational Broadcasting Corporation, New

York City, under the joint direction of the USAEC's Divisions of Isotope Development and Nuclear Education and Training, and the Oak Ridge Institute of Nuclear Studies. For sale by Byron Motion Pictures, at $31.50 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This film traces the development of the use of radioisotopes and radiation in the field of medicine from the early work by Hevesy to the present. The program is presented by Dr. John Cooper of Northwestern University, who is introduced by Dr. Ralph T. Overman, Chairman, Special Training Division of the USAEC's Oak Ridge Institute of Nuclear Studies and regular lecturer of the series. Dr. Cooper's discussion includes the areas of medical research, diagnosis, and therapy. The source of cholesterol in the human body and the applications of this basic information to clinical studies of atherosclerosis is described. Similarly, studies with cobalt-labeled vitamin B-12, used to study pernicious anemia, are also discussed. Most of the information now known about thyroid physiology and pathology has been determined with the aid of various iodine radioisotopes, and standard diagnostic measurements and scanning are described in the film. Brain tumor localization is also covered. A very important area of radioisotope use is the determination of a variety of body fluid volumes such as blood and plasma. Red cell volume and lifetime can also be measured using labeled cells. The film explains how radioisotopes are used for the treatment of various diseases, including hyperthyroidism and cancer.

RADIOISOTOPES IN BIOLOGY AND AGRICULTURE (1964). 26 minutes, black and white.

Produced by the Educational Broadcasting Corporation, New York City, under the joint direction of USAEC's Divisions of Isotope Development and Nuclear Education and Training, and the Oak Ridge Institute of Nuclear Studies. For sale by Byron Motion Pictures, at $32.54 per print, including shipping case, F.O.B. Washington, D. C. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This film is a lecture by Dr. Howard Curtis of Brookhaven National Laboratory, who is introduced by Dr. Ralph T. Overman, Chairman, Special Training Division of the USAEC's Oak Ridge Institute of Nuclear Studies and regular lecturer of the series. Dr. Curtis touches on some of the up-to-date applications of atomic energy to biology and agriculture. Reference is made to the importance of radioisotopic tracers in the determination of the structure and role of nucleic acids and other cellular components. This work is done either with various types of counters or autoradiography. For example, the position of

DNA in the cell has been determined quite specifically. This information has been exceedingly important in the breaking of the genetic code by determining the area of the sub units on the backbone of the genetically important molecules. Similarly, the structure of proteins has been determined using radioactive tracers. In addition to tracer applications, a great deal of information has been gained by studying radiation effects. This has been important both from the standpoint of fundamental knowledge about growth and also the practical applications of economically important mutations. Interesting examples of plant breeding projects are shown. In the animal sciences, important information on the study of aging has come out of the use of radiation as a stress. Various theories of aging have been tested, and it appears that aging is primarily associated with the damage to chromosomes. If the DNA is damaged, animals grow older because of basic instability of DNA. Other examples of the importance of radiation to molecular biology are shown.

RADIOLOGICAL SAFETY (1963). 30 minutes, black and white.

Produced by the Educational Broadcasting Corporation, New York City, under the direction of USAEC's Division of Nuclear Education and Training. For sale by Byron Motion Pictures, at $33.06 per print, including protective film treatment and shipping case. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This film examines the field of radiological safety or health physics, and tries to give a basis for a perspective on potential biological radiation damage. It first considers background radiation and the nature of the difference in this radiation. Larger doses of radiation can be a potential cause of both somatic (direct bodily) damage and genetic (hereditary) damage, and consideration is given to the maximum permissible limits or radiation guide levels which have been established by various radiological protection committees and the Federal Radiation Council. Various units are described, with these including the roentgen, the rad, and the rem. The latter unit is a measure of the biological dose equivalent and considers the relative biological effectiveness (RBE) of the radiation. Consideration is also given to the maximum permissible concentration of radioisotopes in water or air, and the problems involved in the localization of radioactive materials in the body. Various factors that must be controlled in reducing the radiation hazard include the quantity of radioactive material, the distance, the time of exposure, and shielding. Internal exposure must be minimized by the use of special laboratory facilities and techniques which are required to minimize the admission of radioactive isotopes into the body. The importance of having calibrated instruments available is stressed in any program involving the use of radiation sources.

GENEVA, 1964 FILMS

These 24 films, described in the Subject Category listings, were produced especially for professional audience showings at the Third United Nations International Conference on the Peaceful Uses of Atomic Energy, held in Geneva, Switzerland, 1964.

ADDITIONAL TITLES

This section contains detailed information and full descriptions on films released since the publication of the 1965 edition.

AERO-SPACE PROGRAMS:

SNAP (Systems for Nuclear Auxiliary Power)

FIRST REACTOR IN SPACE: SNAP-10A (1966) 14½ minutes, color.

Produced for the USAEC by Atomics International. For sale by Hollywood Film Enterprises, Inc., 6060 Sunset Blvd., Hollywood, Calif. 90028, at $40.40 per print, including shipping case, F.O.B. Hollywood. Available for loan (free) from the USAEC headquarters and field libraries nationwide, and, in California, also from the Library, Atomics International, P. O. Box 309, Canoga Park, Calif. 91304.

Development, launch and results of the world's first nuclear reactor power system to operate in space are described in this semi-technical film, which will be of interest to a wide range of audiences, including high schools. The SNAP-10A unit, consisting of a nuclear reactor and power conversion unit, was thrust into a 700 nautical mile, nearly circular orbit in April 1965 from Vandenberg Air Force Base, California, by an Atlas-Agena vehicle. Following remote start-up, the power plant was operated successfully for 43 days and produced more than 500,000 watt-hours of electricity.

The SNAP program (Systems for Nuclear Auxiliary Power) is being conducted by the USAEC to fill the need for long-lived sources of electrical power in space — sources not dependent on sunlight or affected adversely by the harsh environment of space. Other types of SNAP units also have application on land and in the sea. The power generated by SNAP-10A in space was used primarily to provide power for on-board experiments. But future SNAP reactor systems can supply power for many important purposes — such as to power communication systems, collect scientific data, conduct experiments in space, and supply electricity for life support systems on extended manned missions.

SNAP-10A, a compact reactor, is coupled to a thermoelectric converter-radiator unit which converts heat from fission in the reactor directly into electricity. The heat is transferred to the power conversion unit by a liquid metal coolant, an alloy of sodium and potassium. The SNAP-10A system generates approximately 500 electrical watts.

The motion picture also describes safety of the SNAP reactor during fabrication, testing, transport, installation, launch and use in space, as well as data obtained from the flight. Detailed sequences filmed at Atomics International on fabrication and testing show the simplicity and compactness of the reactor.

See also "SNAPSHOT," a film issued at the time of the launch, which describes pre-flight preparations, development, testing and qualification system tests in greater detail.

SNAP-8: SYSTEM FOR NUCLEAR AUXILIARY POWER (1966). 10 minutes, color.

Produced by the Aerojet-General Corporation. Queries on sale of prints should be directed to Aerojet-General Corporation, Von Karman Center, Azusa, California 91703. Available for loan (free) from AEC headquarters and field libraries. Cleared for television.

In order to travel in space, man must take his own environment with him. This requires power to supply oxygen, drinking water, air conditioning, lighting and to operate communication systems; in short: power to maintain equipment and sustain life itself. Simulating the earth's environment is by no means a new idea. Crews of nuclear submarines live in health and comfort for months at a time while submerged in a hostile environment. This is possible because nuclear energy provides a source of continuous, uninterrupted power. Space voyagers, too, need this same kind of power, and this is where SNAP-8 comes in—using a mercury-vapor turbo-generator system to convert heat from a nuclear reactor into useful electricity.

The film shows the principal components and, in animation, illustrates and explains the operation of the system. Actual fabrication of components and subsystems is also shown, as well as the extensive testing programs currently underway. Thus, SNAP-8 is not a drawing on a drafting table, but a technological reality. Animation sequences are used to depict potential missions of the SNAP-8 system, including power for: TV satellites to broadcast all over the earth, orbiting space stations to support earth observation and space research, maintenance of permanent lunar bases, and manned explorations beyond the moon.

VELA

OPERATION LONG SHOT 13 minutes, color.

Produced for the Defense Atomic Support Agency of the Department of Defense by the U. S. Air Force. For sale by Lookout Mountain Air Force Station, USAF, 8935 Wonderland Ave., Hollywood, Calif. 90046, at $52.19 (1 print), $42.83 (2–10 prints), including shipping case. Available for loan (free) from AEC headquarters and field libraries. Cleared for television.

This film reports on an Advanced Research Project Agency (ARPA) experiment of the Vela Uniform series executed by the Defense Atomic Support Agency (DASA), with the support of the Department of the Interior and the USAEC. Operation Long Shot, an underground nuclear test in the fall of 1965, was conducted on Amchitka, close to the western end of the Aleutian Islands.

The objective of Vela Uniform is to increase the U. S. capability to detect, identify and locate underground nuclear detonations at intercontinental ranges. The primary objective of Long Shot was to investigate possible travel-time anomalies associated with seismic events occurring in island-arc structures. Such anomalies could seriously affect the accuracy of locations made by long range seismic measurements. Another objective was to compare the seismic signatures of man-made versus natural events (earthquakes) occurring in such complex geologic structures.

The film gives details on core drilling, methods to assure safe containment, nature of the rock, lowering of the casing, lowering of the nuclear device, stemming operations, seismic instruments in the close-in monitoring program, the long-range seismic measurement program in Alaska, Canada, the United States and elsewhere in the world, the detonation, and measurements and results.

BIOLOGY AND MEDICINE

EXTRACORPOREAL IRRADIATION OF BLOOD AND LYMPH (1966). 7½ minutes, color.

Produced by USAEC's Brookhaven National Laboratory. For sale by B & O Film Specialists, 619 West 54th Street, New York, New York 10001, at $45.63 per print, including shipping case, F.O.B. New York

City. Available for loan (free) from the USAEC headquarters and field libraries nationwide. Cleared for educational television.

This film, made at AEC's Brookhaven National Laboratory, shows how blood and/or lymph may be irradiated in a well-shielded gamma ray source outside of the body through a closed circuit of teflon tubes from artery to vein. New surgical techniques and plastic methodology have made this tool available for extensive research in experimental animals as well as in human beings. The basic principle concerns the relative radiation resistance of erythrocytes (red blood cells) and the radiation sensitivity of the normal white cells (lymphocytes). The technique, known as extracorporeal irradiation, is still experimental. It may prove to be of some therapeutic value to patients with leukemia and severe kidney disease.

Surgeons working in the operating room section of the experimental animal barn are shown fitting a calf with an external loop of teflon linking the carotid artery to a vein. The loop may be enlarged to include a cobalt-60 or a cesium-137 irradiation source. Before the irradiator is added to the loop, the animals are injected with heparin to prevent clotting of the blood during its flow past the source and back into the animal.

A similar method for irradiation of lymph fluid outside the body employs an external plastic loop from thoracic lymphatic organs to a vein. The lymphocytes—an integral part of the foreign tissue rejection mechanism—may be depleted by extracorporeal irradiation, thus interfering with the normal body reaction of rejection of transfused blood, skin grafts, or organ transplants, etc. The final scenes show a human patient with chronic mylocytic leukemia receiving treatment.

RETURN TO BIKINI (1966). 23½ minutes, color.

Produced for the AEC by the Laboratory of Radiation Biology, University of Washington. For sale by the Motion Picture Service, U. S. Department of Agriculture, Washington, D. C. 20250, at $97.00 per print, including shipping case. Available for loan (free) from the USAEC headquarters and field libraries. Cleared for television.

Describes the latest scientific survey by a team from the Laboratory of Radiation Biology of the University of Washington to determine the condition of Bikini and Eni-

wetok atolls six years after the last nuclear test detonations, and how it is found that there has been tremendous recovery to the biological processes that form the life chain linking man with the tiniest plants, fish and animals in the atolls.

Under an AEC contract, scientists of the University have been studying the biological after-effects of nuclear tests at the mid-Pacific atolls intermittently since 1946. Returning in August 1964, the team of biologists sets out to determine how much radiation remains, what changes have occurred on the reefs, what has happened to birds, land animals and to fish in the lagoons, and what kinds of plants have come back.

The scientists find that: the islands are once again lush with vegetation, external radiation levels have dropped to levels safe for people and the radioactive burdens in animals and plants are low, rainwater in the soil is safe for drinking, coconut trees are increasing again, all the expected species of fish and sealife are to be found, birds are thriving, and that the sea—surging through the coral reefs—has cleaned, restored and nourished the atolls. The scientists conclude that the gross results of nuclear testing are fading, and what little biological damage remains is rapidly healing.

FUELS, PROCESSING, AND METALLURGY

SHEAR-LEACH PROCESS FOR SPENT NUCLEAR FUELS (1966). 11 minutes, color.

Produced by AEC's Oak Ridge National Laboratory. For sale by Calvin Productions, Inc., 1105 Truman Road, Kansas City, Mo. 64106, at $29.45 per print, including shipping case and protective coating, F.O.B. Kansas City, Mo. Available for loan (free) from the USAEC headquarters, field libraries nationwide, and Oak Ridge National Laboratory, Oak Ridge, Tenn. Cleared for television.

Illustrates the development at Oak Ridge National Laboratory of the Shear-Leach Process, a mechanical method for reprocessing spent stainless steel or zircaloy-2 clad power reactor fuels. The various parts of the equipment are portrayed, as well as the operation of the Shear-Leach with unirradiated fuel. The film also summarizes data

obtained from various shearing and leaching tests conducted at ORNL.

PEACEFUL USES OF NUCLEAR EXPLOSIVES (PLOWSHARE)

SAFETY IN THE PLOWSHARE PROGRAM (1966). 22 minutes, color.

Produced by USAEC's Nevada Operations Office. For sale by Consolidated Film Industries, 959 Seward St., Hollywood, Calif. 90038, at $67.83 per print, including shipping case, F.O.B. Hollywood. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This motion picture, which is a companion piece to the USAEC film "Plowshare," documents the means taken to ensure the safety of the public during experiments or projects in the U. S. program to develop peaceful uses of nuclear explosives. The film relates the effects of underground explosions to the varying purposes for the explosions and to public safety.

Nuclear explosives, precisely controlled, are powerful, compact and relatively inexpensive sources of energy which may help produce oil and gas, mine minerals, dig harbors, canals, and mountain passes, and provide important scientific knowledge. Each of these applications uses one or more of the effects of nuclear explosions: heat, explosive force and radiation. The film explains that to allow for the safe and dependable use of nuclear explosives, each of these effects must be thoroughly understood. The effects, their safety implications, and the precautions taken for public safety are demonstrated.

The film explains that technical advances in the design of Plowshare explosives make it possible to reduce to a very small amount the radioactivity produced by an explosion. In cratering explosions, methods of emplacing the explosive underground result in the release to the atmosphere of only a small part of the radioactivity produced. In these explosions, as well as in explosions which are contained completely under the earth's surface, contamination of underground water supplies does not appear to be a major problem.

Other effects of nuclear explosions — ground shock, air blast, and dust clouds — require safety procedures similar

to those taken in many large-scale conventional construction projects. Site choice, weather selection, and, in certain cases, temporary relocation of inhabitants are precautions taken to ensure the public safety.

The motion picture goes through the steps that would be taken in any Plowshare project to protect the public and its property. The film shows the care and planning exercised in a particular project—from the initial safety analysis, to advisory opinions from other government and independent scientists, to final review and approval.

POWER REACTORS

ATOMIC POWER TODAY: SERVICE WITH SAFETY (1966). 28½ minutes, color.

Produced for the Atomic Industrial Forum, Inc., and the USAEC by Seneca Productions, Inc., 21 West 46th Street, New York, N. Y. 10036. For sale by DuArt Film Laboratories, Inc., 245 West 55th Street, New York, N. Y. 10019, at $73.01 per print, including shipping case, F.O.B. New York, N. Y. Available for loan (free) from AEC headquarters and field libraries. Cleared for television.

The motion picture tells the story of central station atomic power plants and how they serve the country now and will continue to do so in the future. Starting with basic information on how electricity is produced from water power and fossil fuels such as oil, gas and coal, the film introduces atomic fuel as a vast new energy resource that helps keep down the cost of electricity. The film shows atomic fuel being fabricated and, through animation, how it is put to work in a nuclear reactor to produce heat which will ultimately be used to produce electricity.

The safety aspects of atomic power, including both natural and engineered safeguards, as well as the demand for dependability by the operating utility and by the customer, are discussed. We see utility conferences relating to a proposed atomic power plant and the care that goes into design and planning.

Since a permit from the AEC is needed before a nuclear power plant may be built, we follow the utility's application through the AEC regulatory review process: public documentation, review by the AEC Regulatory Staff, another

review by the AEC's Advisory Committee on Reactor Safeguards and, finally, a public hearing conducted by an AEC Atomic Safety and Licensing Board. With the approval of the Board and the AEC, construction begins. We see the components of the reactor and associated equipment begin to take shape. Finally, as we see the completed structure, we learn that special operating teams are trained and licensed, and that another AEC review is necessary before an operating license is granted the utility.

Further safety considerations are explored, showing some of the relevant equipment and systems. We learn why it is impossible for a nuclear reactor to blow up like an atomic bomb. The main safety consideration is in maintaining the isolation of the radioactive fission products formed during normal operation. We learn that 99.99 percent of these ashes remain tightly locked within the fuel, and the fuel is removed about once a year from the plant site. The film also deals with handling of wastes and controlled release of material to the environment on a planned basis, according to Federal Safety Regulations.

When the plant finally goes "on the line," it joins other atomic power plants across the nation providing dependable electricity for our many needs. We see a sampling of these plants and the communities they serve, demonstrating that atomic power is here today, providing for our present and future electrical power needs.

SAFETY, WASTE DISPOSAL, AND MONITORING

ATOMS ON THE MOVE: THE TRANSPORTATION OF RADIOACTIVE MATERIALS (1966). 24 minutes, color. Produced by Benni Korzen Productions, N. Y., for the USAEC's New York Operations Office. For sale by DuArt Color Corporation, 245 W. 55th St., New York, N. Y., at $59.34 per print, including shipping case, F.O.B. New York City. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This nontechnical film surveys the various means of transporting radioactive materials and the safety aspects underlying their packaging and handling. Using animation and live action photography, the film illustrates that by their very nature, radioactive materials are varied and

so are the potential hazards associated with shipping and using them. By evaluating the form of the material and the kind and the quantity of radioactivity, one may determine how the materials are properly packaged for shipment. Most radioactive materials are safely shipped by common carrier. The film shows typical shipments enroute: atoms on the move everyday, everywhere by train, truck, aircraft and ship. Varied items are dealt with: ores; atomic fuel for reactors; spent fuel being returned for processing; atomic weapons; radioisotopes for medicine, research and industry; and atomic wastes being shipped for disposal. The film also discusses responsibilities of agencies such as the AEC, the ICC, Bureau of Explosives, Federal Aviation Agency, Coast Guard and state and local offices. Also shown are some aspects of safety research and development designed to limit the consequences of an accident involving these materials. An accident situation and clean-up are shown. We learn that radioactive materials are invaluable tools and products in today's industry and in our daily lives, and how modern transportation moves these materials quickly, quietly, and safely.

CONTROLLING RECORDS FIRES WITH HIGH EXPANSION FOAM (1966). 13 minutes, color.

Produced by AEC's Idaho Operations Office. For sale by Calvin Productions, Inc., 1105 Truman Road, Kansas City, Mo. 64106, at $34.68 per print, including shipping case, F.O.B. Kansas City, Mo. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

This documentary film is a simplified description of high-expansion foam and its characteristics as a fire-fighting agent, particularly with respect to fires involving paper and photographic records in typical open file storage.

The film summarizes the result of high-expansion foam tests conducted at the National Reactor Testing Station in August 1965. The tests disclosed that high-expansion foam provides fast, effective, and possibly least damaging means of extinguishing fires involving various kinds of records, including x-ray films, motion picture films and photographic prints.

Special problems encountered in using the foam are dealt with in the film, together with various means of coping with such fires.

"Controlling Records Fires with High-Expansion Foam" concludes with the test findings that certain types of records containers, labeling methods and storage arrangements are superior to others in minimizing damage from both fires and extinguishing agents.

WASTE DISPOSAL BY HYDRAULIC FRACTURING (1966). 11 minutes, color.

Produced by AEC's Oak Ridge National Laboratory. For sale by Calvin Productions, Inc., 1105 Truman Road, Kansas City, Mo. 64106, at $29.72 per print, including shipping case, F.O.B. Kansas City, Mo. Available for loan (free) from USAEC headquarters and field libraries. Cleared for television.

Depicts the development, at Oak Ridge National Laboratory, of a process for the disposal of intermediate-level radioactive wastes in underground bedded shale formations. The film shows an actual injection of material into the formation, supplemented by animation which portrays the manner in which the grout is forced down into the well and then into the fracture for permanent disposal.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